The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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Colloidal Fuel

COLLOIDAL fuel has been defined by Lindon W. Bates as a combination of liquid hydrocarbon with pulverised carbonaceous substance, the components so combined and so treated as to form a stable fuel capable of being atomised and burnt in a furnace. The practical and commercial application of these so-called colloidal mixtures, the advantages of which have been fully set forth in pamphlets of American origin which have in the main been circulated privately, seems now within sight. The problem of maintaining powdered fuels in suspension for a sufficient length of time was one that demanded the application both of colloidal chemistry and of chemical engineering, and while the birth of this research was due to the exigencies of the fuel problem during the war, its subsequent development has become a purely commercial undertaking. Briefly, the use of one or two per cent. of a "fixateur" or peptising and stabilising agent enables mobile fluids containing up to 40 per cent., or pastes containing up to 70 per cent. of carbonaceous matter, to be prepared with fuel and other oils, and to be burnt in the usual type of oil burners. The fuel being heavier than water presents *inter alia* advantages as regards fire risk, and in addition contains more heat units per *unit volume* than the original oil. A large variety of materials ranging from anthracite dust, washery waste, coal and charcoal to wood dust, wax tailings, lignites and tar oils have already been tried, and where the ingredients are free from sulphur the sulphur content of a high-sulphur fuel oil can be "levelled down" on mixing.

Reference to colloidal fuels in the technical literature of this country has been almost entirely absent, only brief and spasmodic notice having been taken. In April, 1918, the Admiralty offered a reward for a fuel oil made by admixture of a dehydrated coal tar with mineral petroleum oils, but presumably the matter was not followed up, owing to the successful termination of the war. Officially, therefore, we are again to drift, though the use of colloidal fuel both in the Navy and in industry might conserve not only our natural and financial resources, but would materially assist in the solution of the oil situation, and permit the increasing use of oil for industrial purposes to be developed on more rational lines. The man in the street—and in the laboratory and factory—naturally asks, "What has the Fuel Research Board been doing?" It is a pertinent question, which to our mind urgently requires an answer. So far the chief return for the ratepayers' money has been Mr. L. C. Harvey's admirable report on powdered fuel—a one man show—and the slow and painful progress in the experimental station at Greenwich. If the Board has carried out researches on colloidal fuel, have these been treasured in its archives? Has the Board a definite policy or programme, and if so, why are the programme and its results, even if negative, not made public in order to prevent overlapping? Colloidal fuel is, of course, only one instance, though an important one. In a few weeks' time important patents in regard to the "fixateur," which is the patentable matter in regard to colloidal fuel, will probably be published, and it is also rumoured that a new company backed by a leading oil company is to develop the process commercially for the "bunkering" of ships on the principal trade routes.

Meanwhile, the apparent apathy and lack of enterprise of the Fuel Research Board seem to us to require explanation or investigation if the Board is to merit the confidence of the industrial community and of the Empire in the future.

The World's Nitrogen Resources

In our American contemporary, *Chemical and Metallurgical Engineering*, Mr. Chester Gilbert has just brought to a conclusion a series of instructive articles dealing with the political and commercial control of the nitrogen resources of the world. The writer points out that the abrupt termination of the war left the world with a nitrogen producing capacity some 30 to 40 per cent. above the normal requirements. In other words, existing sources will give about half a million tons of nitrogen above the present consumption. This is, of course, merely an apparent overproduction, and to what extent it will prove real is extremely difficult to foretell, particularly as under the stimulus of a food shortage the curve of normal consumption must tend to take a turn upwards. Against this must be placed the fact that there are many new plants not yet in operation. Thus, the general inference to be drawn is that supplies will for some time be in excess of the demand; consequently both price and production are likely to come down.

In view of the situation, Mr. Gilbert endeavours to show how the three industrial sources—namely, the natural, the by-product, and the fixation compounds—will be affected, and how they will fare in competition. By way of a change we find him deriding the rather too prevalent statements that Chilean nitrate is going to be done for. Although the cost of producing the Chilean product may be high it must not be overlooked that it is provided by nature, and it has, therefore, a long start over processes which demand intricate plant and substantial capital outlay. Moreover, the nitrate industry is beginning to be affected by the stimulating influence of healthy rivalry, so that some substantial improvements may be effected in the way of working costs. The operations as now conducted are notable for their systematic crudity, many concerns are over-capitalised, and the product is subject to a high export tax. Again, the fixation sources are almost impossible of analysis on a definite basis of cost. The variable factors and uncertainties may make all the difference between commercial success and failure, while repeated attempts to arrive at an average statement of costs have uniformly emphasised that, given even ideal conditions such, for instance, as cheap power, the cost of production is dangerously close to the normal pre-war cost of nitrogen.

The outlook for by-product ammonia is certainly more defined. The output is increasing consistently and rapidly in all the larger countries, and the effect of the introduction of by-product coking ovens may be judged by a glance at the reports of the Chief Alkali Inspector, who records annually the state of affairs so far as this country is concerned.

Hexahydrobenzene as a Fuel

It is well known that the aeroplane engine can be operated only with the most perfect of liquid fuels; and, as the highest grade petrol appears to be the one spirit readily available for the purpose, it would seem that the time has arrived for an investigation into possible alternatives. It must be admitted that the field in this direction does not give much scope for alternatives; but as we are now building up a home-produced industry in motor-car fuel there is no reason why the process should not be taken a stage further. With benzol available it should be possible to arrive at a practical method for converting it into hexahydrobenzene or cyclohexane, a fuel of proved reliability and consistency. It has been pointed out that even the high-grade petrols, conforming to the most rigorous specifications, show variability in composition, a natural consequence of the fact that they are mixtures. Hexahydrobenzene, on the other hand, is a chemical individual; it has a definite constitution and definite properties; moreover, it is fairly easily prepared from purified benzene by hydrogenation in the presence of metallic catalysts such as nickel. Thus, we get :—

$$C_6H_6+3H_2=C_6H_{12}.$$

When nickel is used as the catalyst, velocity reaction attains a maximum at about 180°C., at which temperature hexahydrobenzene is produced very nearly quantitatively. Temperature control is, perhaps, one of the main points needing attention, for at higher temperatures dehydrogenation commences, while at 300°C. decomposition into methane and carbon occurs. H. S. Taylor has drawn attention to the manner in which the process of manufacture may easily be deranged by the presence of impurities. For instance, sulphur compounds in the benzene or hydrogen, even if present in the minutest quantities, act as catalyst poisons, and lead to diminished catalytic activity, incomplete hydrogenation, and reduction in yield per plant unit. As contrasted with petrol, hexahydrobenzene has a calorific power some 7½ per cent. greater, while the specific gravities of the two spirits are almost identical. It may be recalled that, from a series of trials carried out in America with the famous Liberty aeroplane engine, hexahydrobenzene was found to be the most effective all-round fuel.

Home Sugar Production

The announcement that Government support is to be given to a British factory for sugar production from beet is a reminder of the large commercial possibilities in this field awaiting realisation. It is estimated by Lord Blyth that, in proportion to the number of factories in France before the war, four or five hundred similar beet factories might be required in this country. This first State-supported factory is to be established on scientific principles at Kelham, near Newark, and several of the problems to be overcome clearly fall within the province of the chemist and the engineer. In the first place, some mechanical contrivance is required for "lifting" the crop, and another equally simple and inexpensive for at once screening or washing the earth from the roots. On a railway journey of some hundred miles Lord Blyth found that every 20 tons of beet was weighted with about 4 tons of earth. The cost of carriage was thus raised unduly, the land itself robbed of soil possessing rich manurial values, and the pulp and by-products which could be used to good purpose entirely lost to the farm. The proposal is that within a convenient radius, and, if possible, in the centre of each group of beet farms, there should be a factory where the sugar or at least

the aqueous element could be extracted, enabling the pulp and by-products to be returned direct to the land. An essential need in the organisation of this sugar production industry would be a central Government laboratory to collect and co-ordinate the results of scientific observations and experiment. Here there would be a fine field for the agricultural chemist in ascertaining the most suitable seeds, soils and manures, and so securing the maximum sugar content in minimum bulk. This information would be placed at the service of growers, and a supply of properly tested seeds guaranteed by the State laboratory. With the question of duties and tariffs, of course, we have nothing to do, but the problem of establishing a new national industry, in which chemical and mechanical processes must play an essential part, is one of first-rate interest to both the chemist and the engineer.

Chemistry and the Law

MR. A. LUCAS'S volume on "Legal Chemistry and Scientific Criminal Investigation" (Edward Arnold, pp. 181, 10s. 6d.) opens up a fascinating field for study, but by no means exhausts it. It exhibits chemistry in perhaps the most dramatic *role* it is ever called upon to play—namely, as an agency in the detection of crime and in the dissolution of human mysteries too deep for the lay minds of Scotland Yard. Quite frankly the book has no pretensions to be a complete treatise on legal chemistry—that is, chemistry called in to the service of the law—but consists essentially of a collection of notes based on the author's experience in Egypt. To analysts and other classes of chemists who are habitually called in to assist in police investigations and to give evidence, such information as the author gives is essential to the competent performance of their duties, and to others, who may only occasionally be called upon, it will certainly be of assistance. The sphere of criminal activity in which the chemist is most frequently required is poisoning, for here the analysts' services are indispensable, but the field opened up by this volume is far wider than this and full of variety. The chapters on different subjects are followed by a short list of books of reference, and although the work is not intended to be exhaustive—the author having deliberately restricted it to the results of his own experience—chemists whose work brings them into relation with the processes of the law will find it of service, and those who avoid this thorny pathway will discover much of human and scientific interest.

A New York Greeting

WE have repeatedly had occasion to acknowledge the kindly greetings received from Continental and American readers of THE CHEMICAL AGE. To these must be added this week a letter just received from the editor of one of the most influential scientific journals of New York, with the following pleasant reference to ourselves: "I want to congratulate you on the good showing that THE CHEMICAL AGE is making. I should think all your chemists and industrial manufacturers would find it of value and interest. I am sure that we do on this side of the water. Kind regards and best wishes for your continued success."

The Calendar

April		
12	Society of Chemical Industry (London Section): "The Fertilising Value of Sewage Sludges," by Dr. Winifred Brenchley and E. H. Richards. "A New Test for Incorporation," by Dr. E. P. Perman. "Experiments on Decrepitation," by T. Martin Lowry and L. P. McHatton. 8 p.m.	Chemical Society, Burlington House, Piccadilly, London
12	Royal Society of Arts: "Aluminium and its Alloys" (First Lecture). Dr W. Rosenhain. 8 p.m.	John Street, Adelphi, London.
13	Royal Photographic Society of Great Britain (Scientific Meeting): "Prisms." A. C. Banfield. "Machinery used in the Manufacture of Photographic Plates." A. J. Munro. 7 p.m.	35, Russell Square, London.
13	Sheffield Association of Metallurgists and Metallurgical Chemists: "Valve Trouble and Valve Steels." L. Aitchison.	Sheffield.
13	Institute of Metals (Birmingham Local Section): Annual General Meeting and Dinner. 6.30 p.m.	Imperial Hotel, Birmingham.
13	Royal Institution of Great Britain: "Recent Advances in X-Ray Work" (First Lecture). Major G. W. C. Kaye. 3 p.m.	21, Albemarle Street, London.
14	Society of Public Analysts: Papers by A. E. Parkes; Dr. A. F. Joseph and G. A. Freak; E. Sinkinson; Dr. G. W. Monier-Williams. 8 p.m.	Chemical Society, Burlington House, Piccadilly, London.
15	Chemical Society. 8 p.m.	Burlington House, Piccadilly, London.
15	Society of Dyers and Colourists (Bradford Junior Branch): Paper by G. Sargent.	Bradford.
15	Institution of Mining and Metallurgy: Annual General Meeting. 5.30 p.m.	Geological Society, Burlington House, Piccadilly, London.
15	Chemical Engineering Group (Society of Chemical Industry): Annual meeting, 6.30 p.m. Dinner, 7.30 p.m.	Waldorf Hotel, Aldwych, London.
15	Royal Institution of Great Britain: "New Experimental Studies in the Liquid State (1), Ebullition and Evaporation." S. Skinner. 3 p.m.	21, Albemarle Street, London.
16	Royal Institution of Great Britain: "Ions and Nuclei." Professor J. A. McClelland. 9 p.m.	21, Albemarle Street, London.
17	Royal Institution of Great Britain: "The Thermionic Vacuum Tube as Detector, Amplifier and Generator of Electrical Oscillations." (First Lecture.) Dr. W. H. Eccles. 3 p.m.	21, Albemarle Street, London.
20	Sheffield Association of Metallurgists and Metallurgical Chemists: "Elasticity and the Effect of Strain." A. A. Remington.	Sheffield.
22	Society of Chemical Industry (Birmingham and Midland Section): "Labour Saving Devices in Chemical Works."	University Buildings, Birmingham.
23	Third Conference of the Chemical Engineering Group: "Labour Saving Devices in Chemical Works."	The University, Birmingham.

Pneumatic Handling Installation for Calcium Sulphide*

By G. F. Zimmer, Assoc.M.Inst.C.E.

The articles dealing with labour-saving in chemical works which Mr. Zimmer has written for us from time to time have created a good deal of interest, and we are glad to be able to follow these up with a further contribution descriptive of a somewhat uncommon but effective arrangement.

Calcium sulphide is a difficult material to handle on account of its dusty nature and the injury to the labourers engaged in the atmosphere caused by their labours. It arrives at the works in box trucks, from which it has to be transferred to the factory buildings. All conceivable methods of unloading this material satisfactorily have been tried; it has been found that manual labour is exceedingly slow, and mechanically handled devices, such as portable elevators and conveyors, leave too much of the material in

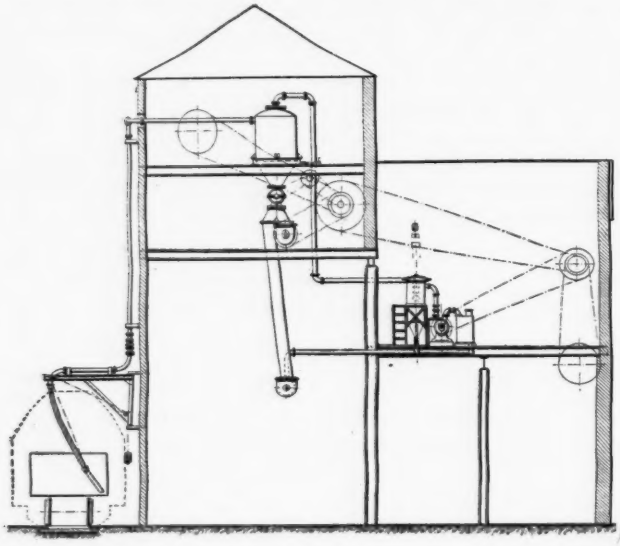


Fig. 1.

the corners of the trucks, and this has to be trimmed out by hand, so that even with such devices not much time is saved over hand work. All methods so far employed have been found unsatisfactory, on account of the dust raised and the slowness of the process. A pneumatic plant was installed at Bernburg during the war, and has been found to work most satisfactorily. It was erected by the firm of Siemens-Schuckertwerke, to whom the writer is indebted for the data and illustrations. The plant is in duplicate, and the layout of one of the units will be readily understood from the line drawing. Fig. 1 shows the railway truck which is provided with hinged top doors (*see* also photographic view, Fig. 2). Into these trucks the suction pipe is led by a man who can easily manipulate the lower flexible portion. And he can direct into all recesses and corners without the creation of dust. The weight of the suction pipe is borne by a slewing jib, and there is a journal in the suction pipe just above the jib, which will permit of these movements. On the top floor of the building the suction pipe enters by two easy bends of 90 deg., and is connected by a straight run to the upper end of the receiver. The pipe generally enters such cylindrical receivers tangentially, so that the air current which conveys the material has a tendency to deposit it as in a cyclone dust collector. From the upper end of the receiver the air is exhausted by a pipe leading down, and then to the exhauster in the adjacent building. As soon as the dust-laden air enters the receiver the speed of its travel—which is very considerable in the pipe—is suddenly reduced, so that not only by the cyclone motion of the air current, but also by virtue of its slower motion the air and material separate, and the latter accumulates in the conical base of the receiver, from whence it is withdrawn by a revolving air trap, and delivered into either one of two large diameter worm conveyors (the end view of which is shown in Fig. 1), which deliver the calcium sulphide into the factory. In photographic view, Fig. 3, the lower cone ends of the two receivers of the t[illegible] plants are seen, as well as the two revolving wheel v[illegible]es which transfer the ma[illegible] out of these receivers wi[illegible]t interfering much with [illegible]acuum in the same. One [illegible] the two worm conveyors is also partly visible in this view.

It may be well to point out that this installation was erected in existing premises, and that the worm conveyors which receive the material were also in situ, and connected the unloading plant with the works. Since existing shafting was available, and as electromotors were not readily obtainable during the war, the necessary driving power for the plant was taken from the existing sources. These remarks are merely necessary in order that the reader may understand that the long-belt drives shown on Fig. 1 are a somewhat clumsy solution of the power provision, and they could be considerably simplified under normal conditions. The exhauster, for instance, which is the principal

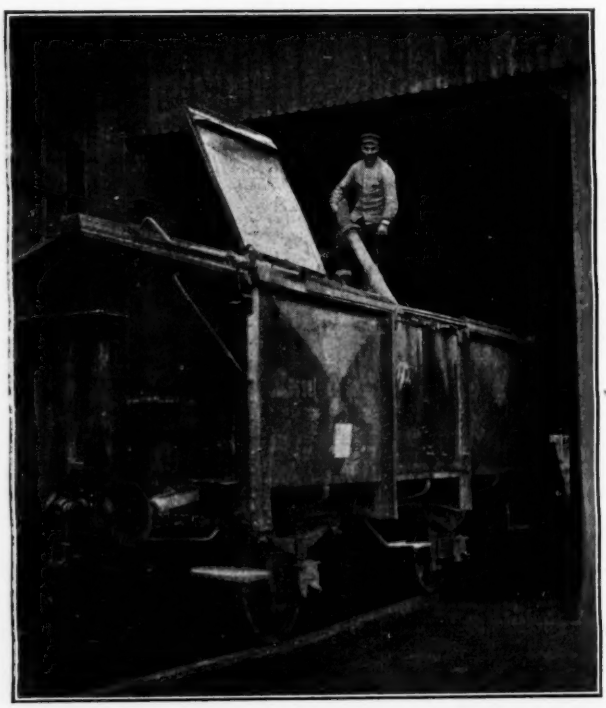


Fig. 2.

* At the works of the Deutsche Claus-Schwefel-Gesellschaft, Bernburg.

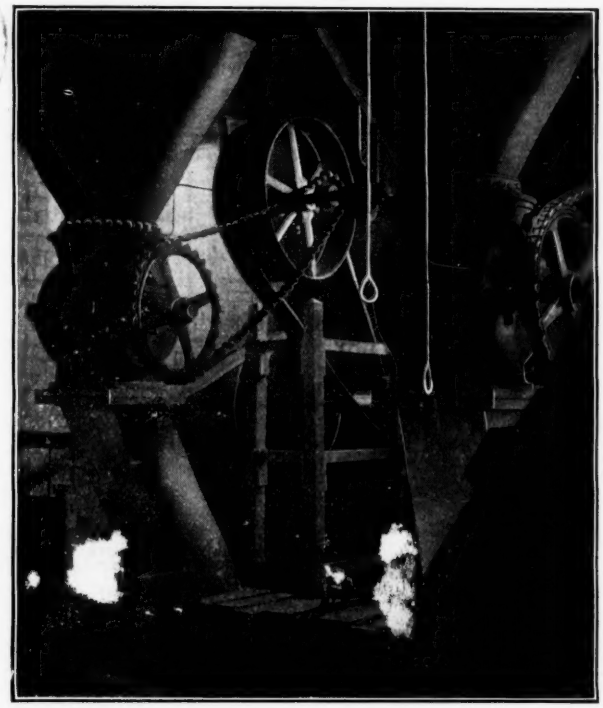


FIG. 3.

power consumer, could have been direct-coupled to an electro-motor, which is the usual procedure.

The exhauster is of a patent rotary type, and as it is of a quite unusual construction it will not be out of place to enter a little more closely into this subject. It is known that reciprocating air pumps, and particularly those with a short stroke, are the most economical exhausters for purposes of handling by pneumatic means; but these are expensive in first cost and also in upkeep, so that there can be no doubt that for the conveying of dusty chemical materials a rotary air pump is by far the most economical in the long run, and the one here in use appears particularly suitable, as will be seen from the following description. Fig. 4 gives a longitudinal and cross-section through one of these machines. In the stationary casing of this pump rotates a spider or star-wheel somewhat eccentrically. Before setting the exhauster into motion it is partly filled with water or any other suitable liquid which, when set into motion, rotates with the spider, and forms an annular body with an airtight fit between the wheel and its casing. There are no valves necessary, which fact deletes half the trouble of other pumps, and by using a liquid as a means of obtaining an airtight fit instead of running metal to metal, the other half of possible trouble is dispensed with. Owing to the eccentricity of the wheel in its casing the eight compartments constantly vary in size as they rotate; and, although there is much actual clearance shown in the drawing, the annular ring of water affords a perfect fit, and keeps every compartment isolated. Thro gh one of the two openings air is continually sucked in and escapes equally continuously at the other, and it is claimed that a vacuum of over 90 per cent. is obtainable. The air ejected by the exhauster, as well as a little moisture forced away with it, is led into a square receptacle in which the water is separated, and from which it re-enters the exhauster while the air escapes into the open.

A safety vessel is installed close to each exhauster in connection with the air pipe, which has the primary object of preventing any solids from being drawn into the exhauster, if by any mischance the receiver should become overfilled. Under normal conditions, therefore, this vessel will merely act as a settling chamber for some of the fine dust which has not separated in the receiver. This fine dust, as well as the still finer matter which has been precipitated in the water vessel connected with the air outlet, is at intervals led back by the small pipe—shown in Fig. 1—into the lower one of the worm conveyors, so that practically none of the calcium sulphide is lost.

The problem of the dust difficulty is thus solved in a satisfactory manner, while when employing piston pumps a most elaborate system of filters would have been unavoidable when dealing with such a dusty substance.

The two safety vessels mentioned may be seen in Fig. 1 standing on the far side of the exhauster, the square water vessel in front on the compression side of the pump, and the safety vessel at the back of the pump on the suction side.

The wheel valve, which mechanically and automatically withdraws the calcium sulphide from the receiver into which it has been sucked, as well as the pipe lines are subject to very little wear, so that it is not necessary to provide renewable wearing parts which are in use for more cutting substances.

The calcium sulphide as received at the factory contains pieces up to the size of a walnut, the remainder is rubble down to fine dust. Either of the two installations is capable of unloading a 10-ton truck in two hours, or a 15-ton truck in three hours. This time includes for marshalling

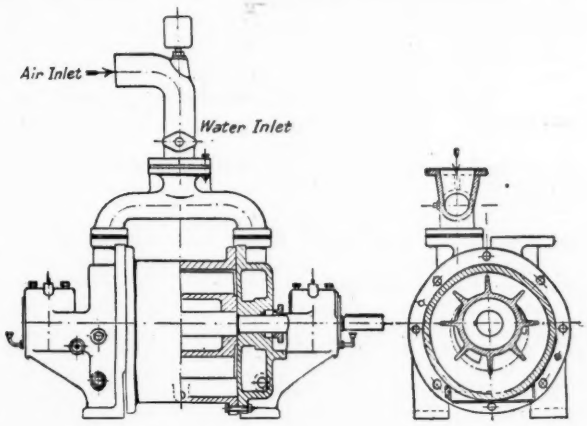


FIG. 4.

the trucks and all other necessary preparatory operations, such as opening the trucks and getting the suction pipe into place. The actual capacity of one set of machinery is on an average 7 tons per hour.

Dyestuffs Sub-Committee

IT is announced by the Board of Trade that a Dyes and Dyestuffs Sub-committee has been appointed under the Profiteering Act, to ascertain to what extent supplies, prices and costs of dyes and dyestuffs in this country are affected by trade combinations, and further to ascertain to what extent the processes of dyeing and finishing are affected by trade combinations. This Sub-committee would be glad to receive communications from any persons or firms who consider that their operations, output, or prices have been affected by any combination, either of dyes manufacturers or of dyers or finishers. Those who desire to submit statements on these matters should communicate with the Secretary, Dyes and Dyestuffs Sub-committee, Standing Committee on Trusts, 54, Victoria Street, London, S.W.1.

Chemists and Labour

To the Editor of THE CHEMICAL AGE.

SIR,—As one greatly interested in the relation of the Universities to the present world crisis, I have been specially interested in the question discussed in your journal "Should Professional Workers Unite with Labour?" Being an onlooker at a distance I can deal only with general matters.

Labour seems now to realise to some extent the value of skill and to wish to unite with it. Perhaps labour will realise that capital is not antagonistic, that labour, skill and capital are all necessary if the industries are to flourish. I do not mean to imply that capitalists have nothing to learn, but labour too often fails to realise the risks incurred by capitalists and the strain and anxiety involved in carrying on a large business.

Mr. Clynes and Mr. Henderson recognise the manual worker and the brain worker as having common interests; the latter says that organised labour has for its objective the abolition of class domination in all departments of social life. This is the proper attitude. Most of us have been under the impression that the object of labour was the domination by labour, that labour rather opposed than favoured skill, that inventions were looked upon with dislike as being liable to take away work, that capital was looked upon with envy as absorbing all the good things. We have regarded labour as not being able to see that ability to work is of little value if there is no one with money to pay for the work, and each labourer has been credited with trying to do as little as possible, partly because grudging to give more than the minimum for the wage earned, partly with the view of leaving work enough for others to do. If labour is coming to realise that there is plenty of work for everyone to do and that it is merely necessary for everyone to get at it effectively in order to make the world a pleasanter one to live in, a great object has been attained, and capital and labour will approach more nearly.

Who are best fitted to help in making this approach still closer? One of Canada's most prominent mining engineers, in an address a few weeks ago to the Engineering Society of Queen's University students, gave it as his opinion that engineers are in this position, as they come into constant contact with the workmen on the one hand, and have close relations with the controlling body on the other. In this connection *engineers* include all who with a scientific education devote themselves to the scientific side of industries, most of the men who take a scientific course in our universities.

Nothing is more essential to the welfare of the body social than the harmonious working of capital, skill and labour. If capital shall say, because I am not skill, I am not of the body, is it therefore not of the body? If skill shall say, because I am not labour, I am not of the body, is it therefore not of the body? If the whole body were labour, where were the money; if the whole were money, where were the brain?

It seems to me that more than for short hours and a minimum wage, labour should press for the encouragement of initiative on the part of the workers. Greater interest in work makes the time seem shorter and the work less wearisome. A man who is tending a machine should be given financial and other encouragement to suggest improvements in the machine, or to contrive another machine to work more efficiently.

My work as professor in the university is mainly teaching quantitative analysis. We have this year a larger number taking up chemistry as a profession than ever before. I have been endeavouring to impress upon the students the necessity for doing the very best work they can, partly with the view to compensate as far as possible for the loss to the world of so many valuable men in the war, partly with a view to holding their own in the competition which they are sure to meet. The same principle applies to all classes. The professors in universities need to do better work than ever, the students need to do better work than ever, mechanics should do better work than ever. The banker, the business man, the monied man, need more than ever to manage finances wisely.

The only universally distributed natural resource is air, or perhaps one may add water. We may use these as lavishly as we like; all else must be conserved. Capital and skill and labour must combine for this purpose. The nation that best attains this idea will have the greatest success. If skill can provide a way of cheap recovery of tin so that we may use the same metal over and over and over again, the soaring prices mentioned in your journal will come down. Waste must be eliminated as far as possible in all directions.

A few weeks ago I was told by the head of a wholesale chemical house in Montreal that German dyes are "cheaper at double the money." I think he was comparing with American dyes. I am not sure whether British dyes were included, and I am not capable of deciding on the correctness of his opinion; though it seems that we have not already attained or are already perfect. This gentleman insisted also that it was necessary for him to buy in the cheapest market if the goods were of equal value; that he could not afford to buy in Canada if the United States gave better terms, nor from the Allies, if Germany sold more cheaply. He used as illustration a lead pencil which he held in his hand. Suppose a pencil manufactured in Canada costs $2 a gross, another from the United States $1.95 a gross, a third from Germany $1.85 a gross. Are they equal in appearance and in value? Yes. Then the German at $1.85 is the one that sells. If he didn't go on that principle his competitors would and he might as well go out of business at once.

We in Canada realise that in Britain there has been great advance in the manufacture of chemicals, and it was a little surprise to me that in spite of this the increase in imports in the United Kingdom in January, 1920, as against January, 1913, was £1,884,940, while the increase in exports for the same date was only £1,596,103.

By what organisation chemists can best make their value known to capitalists on the one hand, and to the so-called labourers on the other I am not prepared to say; but it seems certain that in the first place chemists must be thoroughly well trained, and in the second place must impress upon the public, in some manner, the advantage to the nation at large to be obtained by making the fullest use of their services.

Not only on their own account but on that of the nation as a whole it would be a pity for skill to antagonise either capital or labour. It is to be hoped that the broadening influence of higher education will make the trained men a power for good among all classes.—Yours, &c.,

Queen's University, Kingston, Canada. March 13. JOHN WADDELL.

Organisation of Chemists

To the Editor of THE CHEMICAL AGE

SIR,—The driving force of scientific research is a higher kind of curiosity, and although each generation of scientists places greater powers at the disposal of mankind, most scientists are so absorbed in their work that they live, isolated, in their world of atoms and molecules, far from the whirlpool of politics, so that they do not greatly trouble about the use made of these ever-increasing powers which they give to the world. As the handmaid of medicine, chemistry has given great blessings to mankind. In the hands of the capitalists it has proved a mixed blessing, used primarily to increase dividends. In the hands of the militarists and armament rings it has proved an unmitigated curse. Surely the war has shown only too plainly that it is high time some attention was devoted to the politics of science.

Although the great powers decided long ago that no weak nation may possess any considerable natural wealth, they have not yet evolved any method of deciding which group of capitalists shall exploit their natural wealth and cheap labour, except arbitrament by war, which the misuse of science is making more horrible. Poison gas, bombs and aeroplanes have become a normal part of military equipment, and the reactionaries are as ready to use them against their own democracies as they are to use them against foreign armies.

It is high time that scientists decided whether they are going to allow science to become the handmaid of militarism and reaction. If they are, then the advance of science will only lead to the destruction of civilisation. If they are not, then scientists, and especially chemists and engineers, must organise internationally and take a definite stand on the side of democracy. Professor Soddy has given a brave lead, and declared that, "either individualism must give way to Socialism and Co-operation, or science must stop." What are the scientists doing to follow up this lead? It is urgent that the

scientists shall organise to obtain not only economic but political control of the fruits of their labours, instead of allowing them to be used indiscriminately for good or for evil. If the scientific societies consider they should continue to have either reactionary politics, or no politics, then the new scientific unions must organise internationally, and help the other workers to establish a real international strong enough to frustrate the sinister designs of any leagues of capitalist, imperialist governments, and see that science is used for building the new world, and not for prolonging the agonies of the old world of secret diplomacy, grab, and the exploitation of man for private profit.—Yours, &c.,

University Socialist Club, Lincoln's Inn, W.C. April 5. GERALD H. MARTIN.

A New Benzol Problem

To the Editor of THE CHEMICAL AGE

SIR,—The editorial paragraph, "A New Benzol Problem," in your issue of April 3, is interesting.

I think it is hardly necessary to warn the motorist against close contact with benzol fumes, because the risk of fire is quite enough to prevent him from preparing such an atmosphere, and the smell of a benzol-laden atmosphere is enough to prompt him to keep clear and cause ventilation.

Regarding the symptoms of inebriety resulting from close contact, my findings are in agreement with Herr Schwenke's, but such cases as the "songster" mentioned in your paragraph must be extremely rare.

On one occasion I arranged for a 6,000-gallon crude benzol tank to be cleaned out, it being so badly slimed. I had the tank ventilated for two days and filled with water, and then allowed to stand another day to expel any gas in the slime. The water was run off and the tank allowed to stand ventilating a further day before cleaning commenced. I considered the above precautions sufficient to make the work of cleaning safe, but I soon found the air inside so bad that after 10 minutes of it, the cleaner and myself were in such a condition that any policeman would have been justified in taking us in charge. I may add in this case, the main trouble was due to the presence of H_2S, as well as benzol vapour.

Once, whilst filling tins with motor benzol, I was nearly "gassed," which made my brain reel and my head feel like bursting, and walking decently impossible. I know of a case of close contact which resulted in the person developing a throat cough which remained some considerable time after the contact.

With regard to the effect of benzol vapour on the vocal chords, I may say I have a benzol refiner who was so badly gassed at the front that he lost his voice and is now slowly recovering. He, recently, was examined by a certain Medical Board which reported that his work would in no way retard his recovery. I mention these cases as extreme ones and rare.

Benzol vapour has no effect on a man who is troubled with insomnia.

While on this subject, has not the pronunciation got something to do with the spelling of benzol or benzole? We have —"ol," as in doll, and—"ole," as in hole. Why do the makers of laboratory apparatus not advertise their wares as the Americans do? It would help the chemist considerably and keep him up to date.—Yours, &c.,

Cockermouth, April 3. HAROLD ROOK.

A Question of Spelling

To the Editor of THE CHEMICAL AGE.

SIR,—The erratic influence of custom in chemical nomenclature and spelling is, unfortunately, considerable, but it should be minimised for the sake of that orderliness and logical sequence that is the essential characteristic of science. The termination "-ol" is the recognised attribute of an alcohol, therefore, let custom give way, and let benzol and the like disappear. That the spelling "benzol," or "toluol," is a transgression of an established rule is, I submit, sufficient reason for its abandonment.

The vagaries of custom may also be cited in attempted justification of the curious practice, occasionally met with, of spelling benzole with an "e," and toluol without one; also, in writing naphthaline for naphthalene. It is obvious that the latter should be adopted to bring the form of the word into family association with benzene, anthracene and the rest, as well as to prevent its excursion into the realm of the amines. For analogous reasons aniline could never legitimately be spelt anilene.—Yours, &c.

PERCY E. SPIELMANN.

Education and Chemical Industry

To the Editor of THE CHEMICAL AGE.

SIR,—May I congratulate you on the excellent outline of a scheme of education for chemists contained on page 346 of the current issue of THE CHEMICAL AGE?

The experience of a very large number of industrial chemists and of employers is that men with such a training are not only equal to those chemists who have "graduated by the normal methods of day classes," but that in most instances they are worth more to industry because their industrial experience enables them to appreciate more fully their theoretical studies and ensures that, from the very commencement of their studies, they have a mental outlook which is of greater value than can be obtained by devoting themselves exclusively to study and then entering the works.

Where a man wishes to train as a teacher of chemistry the conditions are entirely different, but for industrial chemists your scheme is, in my opinion, one of the best which has hitherto been published. It is very closely in line with the scheme favoured by the National Association of Industrial Chemists, and such small differences as exist are not worth the consideration of your readers at the present moment.—Yours, &c.,

The White Building, Sheffield. April 6. A. B. SEARLE, (Hon. Sec. of the National Association of Industrial Chemists).

War Honours for Chemists

The additional lists of honours published since our last issue contain the names of the following:—

OFFICERS (O.B.E.)

Henry Stephen, Esq., Voluntary Research Worker, Chemical Warfare Department, Ministry of Munitions; Lecturer in Chemistry, Manchester University.

Reginald Thompson, Esq., Fields Manager, Anglo-Persian Oil Co.

Stephen Herbert Trimen, Esq., Chief Chemist, Egyptian Government Laboratory.

Thorp Whitaker, Esq., Adviser to Dyes Department, Board of Trade.

MEMBERS (M.B.E.)

Aquila Forster, Esq., Research Chemist, Research Department, Royal Arsenal, Woolwich.

Reginald Genders, Esq., Research Chemist, Research Department, Woolwich Arsenal, Woolwich.

Kenneth Claude Devereux Hickman, Esq., Research Chemist, Chemical Projectile Laboratory, Wembley, Ministry of Munitions.

Lionel Orange, Esq., Chemist, Explosives Supply Department, Ministry of Munitions.

William Perceval Paddison, Esq., Research Chemist, Research Department, Royal Arsenal, Woolwich.

Colin Egbert Parkes, Esq., Manager, National Amatol Factory, Leeds, Ministry of Munitions.

Miss Eleanor Pearse, Recorder of Chemical Warfare Committee, Ministry of Munitions.

Cyril James Peddle, Esq., Chemist, Derby Crown Glass Co., Ltd.

John Edward Perrin, Esq., Assistant, Oils and Fats Branch, Ministry of Food.

George Francis Poole, Esq., Chief Inspector, Oils and Fats Branch, Ministry of Food.

Frederick Henry Rolt, Esq., National Physical Laboratory, Ministry of Munitions.

William Leslie Turner, Esq., Research Chemist, Research Department, Royal Arsenal, Woolwich.

Walter Charles Waugh, Esq., Mineral Oil Production Department, Ministry of Munitions.

Mrs. Winifred Young, in charge of Information and Records Bureau, Chemical Warfare Committee, Ministry of Munitions.

THE MINISTRY OF HEALTH has acquired £75,000,000 worth of radium from the Ministry of Munitions. This is the residue of the stock purchased for war purposes—the illumination of watch dials and gun sights. It is now to be used by the Medical Research Committee for their investigations in the cure of cancer.

The Constitution of Inorganic Compounds

A Lecture by Professor G. T. Morgan

A SPECIAL meeting of the Chemical Society of the Royal College of Science was held on Friday, March 19, and the Society was fortunate in that Professor G. T. Morgan, who had consented to deliver a lecture on this occasion, selected as his topic one of the most interesting branches of the theory of inorganic chemistry, and one to the development of which he has himself largely contributed.

The Occurrence of Extraneous Molecules

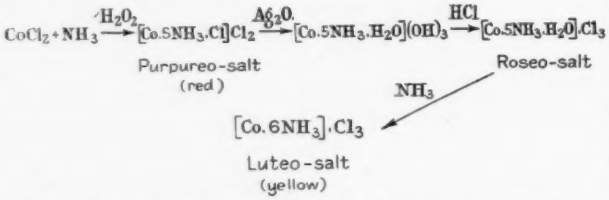
The lecturer first drew attention to the fact that for many years past the greatest progress in synthetic chemistry has been made in the organic branch, and that, by reason of one guiding principle which holds throughout the whole region of carbon derivatives—namely, the quadrivalency of carbon—it is generally possible to assign a definite constitution to any organic compound, once its synthesis has been effected. Though there are but few inorganic compounds which cannot be synthesised, there is often a difficulty in determining the constitution; for instance, artificial ultramarine was made in 1835 in France and Germany independently, yet its constitution is by no means understood. Our ignorance of atomic groupings in inorganic compounds arises, then, from the fact that we know so little of the valency in certain cases.

Copper sulphate is generally represented by the formula $CuSO_4 . 5H_2O$, a formula which serves to indicate that we do not know the constitution of the compound. The water present is not all in the same state of combination, for whilst four-fifths may be removed at 100°C., the remainder is retained up to 220°C.; and the physical properties of the compound are dependent just as much on the presence of the five molecules of water as on the copper atom. Calcium chloride, if exposed to damp air, will take up six molecular proportions of water; if exposed to ammonia, it will absorb eight molecular proportions. Quick baryta slakes to barium hydroxide $Ba(OH)_2$, which in formula is represented as an atomic compound; but, crystallised from aqueous solution, it separates with eight molecules of water, and the product is represented differently as $Ba(OH)_2 . 8H_2O$. Sodium chloride takes up two molecules of water at low temperatures or by crystallisation from strong hydrochloric acid. Sodium sulphate crystallises with 10 molecules of water below 33°C., and in the anhydrous form above that temperature. Thus, there is a general tendency for the anhydrous compound to combine with water, and this tendency is most marked in the case of the copper salt. In the case of many of these compounds there is a certain number which recurs. Nickel sulphate crystallises as $NiSO_4 . 6H_2O$; if the crystallisation occurs in presence of ammonia the production of a modified form is induced, giving a solution which is no longer green but blue, and from which the sulphate may be crystallised as $NiSO_4 . 3NH_3 . 3H_2O$; by suitable concentration of the ammonia it is possible to obtain crystals represented by the formula $NiSO_4 . 6NH_3$. The recurrence of the number six in these molecular compounds is significant.

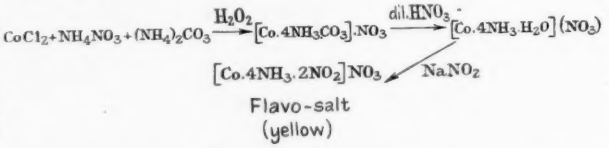
Cis and Trans Series of Chromium and Cobalt Ammines

Anhydrous chromium chloride on treatment with liquid ammonia absorbs a considerable amount of the liquid and yields two compounds—$CrCl_3 . 5NH_3$ and $CrCl_3 . 6NH_3$—which may be separated by utilising the lower solubility of the former. It is further found that with the former only a proportion of the chlorine is capable of precipitation by silver nitrate, whereas all the chlorine in the second compound may be thrown down. Hence a further arrangement is possible—$[Cr.5NH_3 . Cl]Cl_2$ and $[Cr.6NH_3] . Cl_3$—in which the ionised chlorine atoms are placed outside the bracket.

Similar substances have been obtained with cobalt. If a solution of cobaltous chloride is mixed with ammonia and treated with almost any oxidising agent (such as hydrogen peroxide) a compound is formed which resembles the first of the chromium compounds. This compound (purpureo-cobaltic chloride) is red in colour, and all the chlorine is not precipitable. On treatment with moist silver oxide a strongly basic hydroxy-compound is obtained, which, with hydrochloric acid, yields roseo-cobaltic chloride $[Co.5NH_3 . H_2O]Cl_3$. Heated with strong ammonia under slight pressure this substance suffers elimination of a molecule of water, and the yellowish luteo-salt is obtained $[Co.6NH_3]Cl_3$. The associating groups in this series are variant, but there remains the recurrence of the six associating units in contact with the cobalt.



If the original oxidation is carried out in the presence of a carbonate, the initial product is a little different in type; and, by the series of operations indicated, the yellow flaveo-cobaltic nitrate $(Co.4NH_3 . 2NO_2) . NO_3$ may be obtained.



A further series of salts may be obtained by atmospheric oxidation of cobalt chloride in the presence of ammonium chloride, sodium nitrate and ammonia, yielding the light yellow croceo-cobaltic nitrate (and corresponding chloride)—$[Co.4NH_3 . 2NO_2] . NO_3$.

That the flaveo- and croceo-cobaltic nitrates are not identical is shown (in addition to the colour difference) by the fact that different products result from boiling each with concentrated hydrochloric acid.

$$\text{Flaveo-salt} \xrightarrow{HCl} [Co.4NH_3 . 2Cl] . Cl \quad \text{(green)}$$

$$\text{Croceo-salt} \xrightarrow{HCl} [Co.4NH_3 . NO_2Cl]Cl \text{ (deep red)}$$

In the former case, where both nitrito groups are removed, the two groups have been shown to be closer to one another than in the latter case, where one only is removed.

The two isomerides are further distinguished by the ethylene-diammine derivatives, which are obtained by the replacement of two ammonia molecules by a single molecule of ethylene-diammine, $\begin{matrix} CH_2 . NH_2 \\ CH_2 . NH_2 \end{matrix}$ (generally represented by "en"). The two isomeric derivatives $[Co.2en . 2NO_2]Cl$ thus obtained from the flaveo- and croceo-cobaltic nitrates show one remarkable difference, in that the flaveo-derivative is resolvable into two optically active isomerides, rotating the plane of polarisation in equal amount in opposite directions, whilst the croceo-derivative is incapable of such resolution. The former is termed the "*cis*" series, the latter the "*trans*" series.

Conception of Residual Valency

To attempt an explanation of these facts, one may employ the simplest conception of a chemical element—as a sphere with the affinity distributed uniformly over the surface; but owing to the fact that chemical combination occurs between one, two, three or four atoms, the valency has to concentrate itself on the attraction of an integral number of associating units, either elementary in nature or compound. As a result, we are led to the view that all the elements have integral valencies, *i.e.*, valencies which are equal to or multiples of the valency of hydrogen. This view is almost incapable of experimental justification. It is, on the other hand, suggested that an apparently trivalent element may actually possess a valency slightly more than three but distinctly less than four, and that this "residual valency" (Armstrong) remains normally unexercised, since an element cannot attract a fraction of an atom. As a result, there arises a tendency towards a certain amount of residual affinity which may become operative when the principal valency has already been satisfied. It is not necessary to suppose that this residual affinity is of any considerable magnitude by comparison with the principal valency. Consider two analogies. When moist air is cooled below the dew point with an atmosphere free from dust, the moisture settles as dew; but if the atmosphere be filled with dust the moisture settles out as a fog, each dust particle becoming a nucleus round which the water molecules associate. There is no great force of attraction between the dust particle and the associating water molecules; the effective force is much more likely to be the tendency of the water to separate out under those conditions. Secondly, the atmosphere contains a number of electrified particles, which have been shown to differ considerably in magnitude, some being simple sub-atomic electrons and some complex. By passing air down a tube the top and bottom of which were at different electric potentials it has been found possible to separate the simple electrons from those which have become associated with molecules of water. This association of a system of water molecules with electrified particles provides a very close analogy with what occurs when a cobalt ion is generated in a solution. The ion thus produced associates itself with a portion of the liquid. When this liquid consists of ammonia, there results the formation of a complex system like the fog particle or the complex ion of the atmosphere. Yet the effective force is actually the tendency for association which is a property of the associating unit. These groups, whether they are elementary or compound, have always a large degree of unsaturated valency—*e.g.*, NH_3, H_2O, $-NO_2$, $-Cl$. Thus, the effective force emanates in all probability from the associating units quite as much as from the central nucleus.

Co-ordination Compounds and Atomic Volume of Nucleus

A further point arises from a consideration of the atomic volume curve in its bearing on the relation between the nucleus and the associating units. Sodium and calcium, the positions of which on the crests of the curve indicate high atomic volume, may be contrasted, from the point of view of the stability of these complexes, with chromium, cobalt, copper and the platinum group, which occupy the troughs of the curve. It is precisely those elements with a very low atomic volume which form the most complex ammonia derivatives; and it has been shown in recent years by Ephraim that the stability of these ammines is determined by the smallness of the atomic volume of the central atom.

Symmetrical Configuration of Complexes

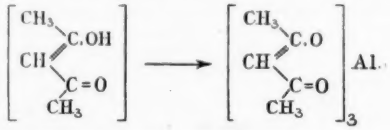
Furthermore, these associating units are attracted towards the central sphere by a gravitational force. But, since they may become similarly electrified by induction, a tendency to electrical repulsion may be developed. As a result of this attraction towards the centre and this mutual repulsion, the units will tend to set themselves in a symmetrical position. If formed in any other configuration the less symmetrical forms tend to disappear, and in the struggle for existence (which applies in the inanimate as well as in the animal world) the most symmetrical forms tend to persist. This brings us to the question of the recurrence of the number six. If the formation of symmetrical compounds is a determining factor in both organic and inorganic compounds, the problem is somewhat simple, because there are only five ways of arranging systems of points symmetrically on a sphere. We have the arrangements provided by the four vertices of a tetrahedron, which is characteristic of boron and carbon; by the six points of the octahedron; by the eight points of the cube, which may possibly represent the arrangement of the ammonia molecules in $CaCl_2.8NH_3$; by the 12 points of the icosahedron, in which connection the general formula of the alums $R''.R'(SO_4)_2.12H_2O$ may be noted; and finally by the 20 vertices of the dodecahedron. Instances of the last case are rare, and the reason is probably to be found in the fact that only 12 other spheres can be arranged round and in contact with a central sphere of similar size. Supposing that the central element has so much chemical affinity that it could attract five associating units, it is unlikely that such a complex could arise, since it is impossible to arrange five points symmetrically on a sphere. Some compounds of thorium give a 10 point system which is very nearly symmetrical. Hence, regarding symmetry as the determining factor, it begins to become clear as to why the number six occurs so frequently. Occasionally this point may be obscured. For instance, there are sulphates of the formula $RSO_4.7H_2O$; but in this case six of the water molecules only are associated with the cation, the other being attached to the anion.

Optical Isomerism

The formation of the ethylene diammine derivatives of the flaveo- and croceo-salts may then be symbolised by representing the ethylene diammine group as fixing itself like a pair of calipers on two adjacent apices of the octahedron. When the two "calipers" are thus fixed, there remains only the choice of two other arrangements (two mirror images) for the remaining two units of the complex; and this corresponds with the existence of two optical isomerides. The three ethylene-diammine derivatives (the non-resolvable croceo-compound and the two enantiomorphous flaveo-isomerides) have been realised in the case of chromium, cobalt and rhodium. Substances possessing this "caliper"-linking shown by ethylene-diammine compounds may be termed "chelate" substances, by derivation from the "chelæ," or pincers of the crab.

In all, 23 series have been resolved by Werner, some of which contain three caliper-groupings, some two caliper-groupings and two similar elements, others with two caliper-groupings and two dissimilar elements. In the case of iron an interesting chelate compound is employed. Ferrous chloride does not form well-defined ammonium or ethylene diammine compounds; but by means of the powerful chelate substance $\alpha\cdot\alpha$ dipyridyl,  , the two optical isomerides [Fe″.3Ph] may be produced.

Up to the present no compound with six associating units, but without an outside ion, has been resolved. It was once thought that this might be achieved by the use of acetyl-acetone. This is a keto-enol form, acting partly as a ketonic and partly as an unsaturated alcohol, and with the remarkable property of giving volatile compounds with such metals as manganese and scandium. Aluminium, for instance, will co-ordinate with the ketonic group by means of the residual valency; hence, three atoms will link up with the aluminium,



This substance, aluminium acetylacetone, and equally all other comparable metallic derivatives, should be racemic.

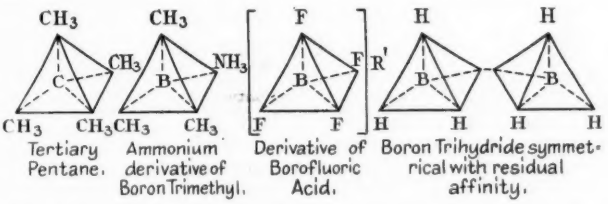
If the co-ordination theory of the constitution of inorganic compounds be true, we should have not only compounds with central atom and associating units, but also cyclic compounds.

Elements Showing Tetrahedral Symmetry

Tetrahedral symmetry has not been studied so much as in organic chemistry. The co-ordination number four is associated with elements of low atomic volume—carbon, in which case the valency shows a coincident value; boron, with valency three and co-ordination number four; glucinium, with valency two. What is the meaning of the term "co-ordination number four" as applied to boron? The fact that the anion of potassium borofluoride, which contains boron, also contains associating units to the number of four. Boron trimethyl corresponds with tertiary pentane in the carbon series, and resembles it considerably in chemical properties; but whilst tertiary pentane is a typical paraffin, boron trimethyl is unsaturated, and has been shown by G. Frankland to give with ammonia a crystalline substance with definite melting point. This fact and the combination with caustic potash may be explained by the co-ordination theory, without assuming any alteration of the principal valency of boron.

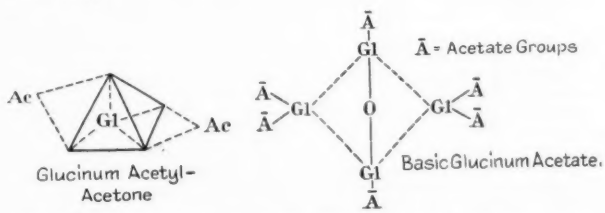
$$BF_3 + HF \rightarrow HBF_4 \rightarrow KBF_4 \rightarrow K^+ + \overline{BF_4}$$

Within recent years a remarkable development has occurred in the chemistry of the hydrides of boron and many such compounds besides BH_3 have been discovered. It may be said that "the theory of integral valency was founded on the hydrocarbons, and will founder on the hydroborons." The hydrides now known include B_2H_6, B_4H_{10}, B_6H_{12}—a range which is incapable of explanation on any basis of integral valency, but easily explained by the co-ordination theory. Boron possesses a principal valency which is incapable of symmetrical disposition, and the residual valency makes it assume the symmetrical tetrahedral configuration, thus giving rise to such compounds as HBF_4 and B_2H_6 (BH_3 being non-existent).



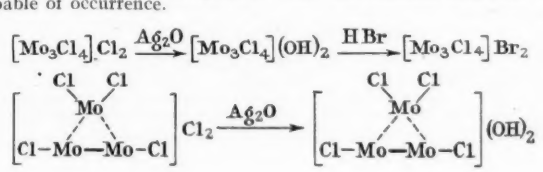
The inertness of the paraffin series may be explained by the fact that, were the valency even slightly in excess of four, the formation of a pentavalent type would be prejudiced by the dissymmetry of the type.

Glucinium forms compounds $GlSO_4.4H_2O$, K_2GlF_4, and hence, in accordance with its low atomic volume, shows co-ordination number four. Its acetylacetone compound can be distilled. It forms also a remarkable basic acetate, containing four glucinium atoms, six acetate groups and an oxygen; it persists in glacial acetic acid, is insoluble in water but soluble in organic media, has a definite melting point, and can be sublimed without decomposition. This display of the characteristics of the acetylacetones can be explained by the formula suggested, which, be it noted, includes a ring and a central bridge.



Nitrogen (valency 5, co-ordination number 4) has a value for the valency in excess of the co-ordination value, and the groups commonly associated with nitrogen have a tetrahedral configuration. A compound of the type [Nabcd]Cl has been resolved into two optical isomerides (the letters a, b, c, d representing phenyl, benzyl, allyl and methyl groups respectively).

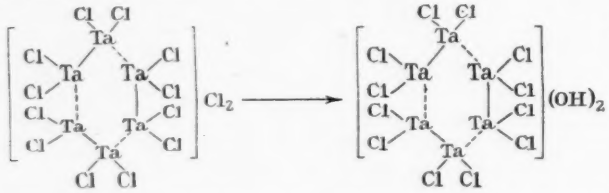
In the case of molybdenum the lowest valency corresponds with the chloride $MoCl_2$, molecular weight determinations of which, however, have indicated the formula Mo_2Cl_6. Of the six chlorine atoms, two only are precipitable; and the reactions indicated are capable of occurrence.



Tantalum and columbium, two quinquivalent and tervalent metals of the nitrogen group, have recently provided certain curious compounds. By treatment with sodium amalgam the chlorides are reduced to a complex of which only one-seventh of the chlorine is ionised.

$$Ta_6Cl_{14} \xrightarrow{\text{alkali}} [Ta_6Cl_{12}](OH)_2 \xrightarrow{HBr} [Ta_6Cl_{12}]Br_2$$

Such a complex suggests something in the nature of a cyclic structure and a constitution similar to cyclohexane is apparently indicated.



The alternation of principal and residual valencies in the ring is comparable with the alternation of double and single linkings in the benzene nucleus.

Applications of the Co-ordination Theory

First of all, one factor in the stability of inorganic acids and salts is the symmetrical arrangement of the associating units. All the acids in which three oxygen atoms are associated with the non-metal are relatively unstable; those with four are all very stable, tetrahedral arrangement giving stability.

H_2CO_3 H_2SO_3 H_3PO_3 $HClO_3$
H_2SO_4 H_3PO_4 $HClO_4$

Crystallographic Anomalies

The theory provides an explanation of several such anomalies—that calcium carbonate continues to grow in a solution of sodium nitrate, and that aragonite is isomorphous with potassium nitrate. A classic series of double salts, due to Marignac, is explained by this theory. According to the Law of Isomorphism, this series of double fluorides should contain the same number of atoms similarly arranged; but on the theory of integral valency it is difficult so to arrange them unless fluorine and oxygen are regarded as having equivalent positions in the co-ordination complex.

$K_2\ Ti\ F_6.H_2O$
$K_2\ Cl\ O\ F_5.H_2O$
$K_2\ W\ O_2\ F_4.H_2O$

K_2SO_4 is isomorphous with $K_2\ Gl\ F_4$, and that again is isomorphous with tetramethyl ammonium mercuric chloride

$$[N(CH_3)_4]_2HgCl_4.$$

Water of crystallisation may also enter into the question of the co-ordination number in isomorphous salts—*e.g.*, $K_2\ Sn\ Cl_4.\ 2H_2O$ and $K_2\ Te\ Cl_5.H_2O$.

A further series is provided by the phosphates of the rare earths YPO_4, $ZrSiO_4$, $Sn.SnO_4$ (cassiterite SnO_2), $ThSiO_4$, $Pb.PbO_4$. Hence, the theory explains why substances which are not usually regarded as being similarly constituted may actually crystallise in the same way.

An application to metallurgy is instanced by the case of nickel. In the compounds already noted, $NiSO_4.6H_2O$, &c., nickel, the valency of which scarcely ever exceeds two, shows co-ordination number six; but in the unstable double cyanide, by which its separation from cobalt is effected, and in its carbonyl, it shows the lower value of four—$K_2Ni(CN)_4$, $Ni(CO)_4$.

The theory has its bearing also on mineralogical questions. Calcium chloride normally crystallises with six molecules of water; but in a granitic rock, where the little water available is mostly absorbed by the mica, calcium phosphate and chloride occur. The calcium phosphate does not separate out in the cooling of a granitic magma as $Ca_3(PO_4)_2$, but in conjunction with the chloride as chlorapatite.

$CaCl_2.\ 3Ca_3(PO_4)_2$	... ...	chlor-apatite.
$CaF_2.\ 3Ca_3(PO_4)_2$	... ...	fluor-apatite.
$PbCl_2.\ 3Pb_3(PO_4)_2$	... ...	in mineral veins, as hexagonal prisms of the $CaCl_2.6H_2O$ type.
$PbCl_2.\ 3Pb_3(AsO_4)_2$	... ...	
$PbCl_2.\ 3Pb_3(VO_4)_2$	... ...	

An interesting extension is drawn from a study of bone phosphates by Bassett in 1914. Bone phosphate is not exactly calcium phosphate, but a hydroxy compound—$Ca(OH)_2.\ 3Ca_3(PO_4)_2$ hydroxy-apatite.

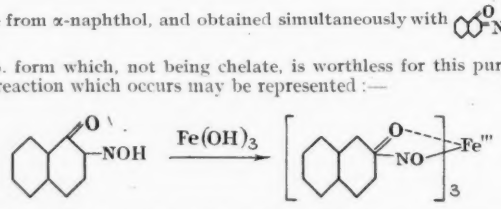
Application to Mordant Dyeing

There is every reason to believe that the co-ordination principle applies in the modern extensions of the ancient art of dyeing. The reason why alizarin and other dyeing principles which can be applied in conjunction with metallic mordants is that they are chelate substances, like acetylacetone. A pair of skeins of wool may be dyed brown and green respectively with the same colouring matter, the difference between them being in the choice of metallic mordant.

The chelate substance used is an α-isonitroso compound

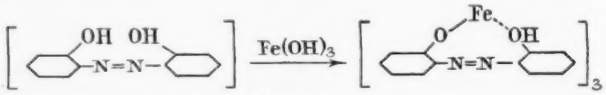
made from α-naphthol, and obtained simultaneously with

the p. form which, not being chelate, is worthless for this purpose. The reaction which occurs may be represented:—



The co-ordination colour of iron is green, of chromium brown and of cobalt red. The cobalt dye is the stablest of the series, and this serves to confirm the view that co-ordination action occurs, since the cobalt-ammines are the most stable.

The co-ordination occurs equally with the azo dyes. They are all distinguished by having a general chemical constitution. Dull shades of red are obtained by the use of dyes without a mordant; with a vanadium mordant the colours are even more pleasant than with chromium. With the exception of the copper mordant, they have all a precisely analogous configuration, involving two hydroxyl groups.



Professor Morgan, on concluding his lecture with the remark that this principle was capable of indefinite expansion in commercial processes, received a hearty vote of thanks from the audience as an expression of its appreciation of an extremely able and interesting discourse on a subject of vital importance and of no slight difficulty.

Coal and Its By-Products

MR. J. R. L. ALLOTT lectured before the members of the Wolverhampton and District Engineering Society on "Coal and its By-products," at the Technical School, Wolverhampton, on Friday, March 26.

Describing the plant at a North Staffordshire colliery, where the manufacture of coal into coke and its by-products is extensively carried on, he pointed out that in the saturator the ammonia gas was caused to combine with sulphuric acid to form a salt of sulphate of ammonia. If concentrated liquor were to be made instead of sulphate the ammonia gas and steam from the still was led into large cast-iron vessels fitted with lead coils through which cold water was flowing. The steam became condensed to water which dissolved the ammonia, and formed a strong solution containing 17 per cent. ammonia. The creosote oil passing from the scrubbers contained about 4/5 per cent. of benzol, and to extract the latter the oil was subjected to a distillation process. The crude benzol thus obtained consisted of benzene, toluene, xylenes, naphthas, along with impurities such as pyridene, thiophen, carbon disulphide, creosote, naphthalene and pitchy substances. The rectification of benzol from the crude spirit was then fully explained.

In the distillation of the tar the stills could either be fired with solid fuel or gas, but towards the end of the distillation steam was used in an interior coil for better control. In this operation of distilling, like others, advantage was also taken of the different boiling points. The tar distiller knew by experience when to stop the distillation somewhere between 300°C. and 350°C. according to the quality of the residual pitch required.

Mr. Allott then explained the conversion of benzene by treatment with heat acid and alkalies into the explosive, picric acid or trinitrophenol.

Recent Wills

Mr. A. Holt, of Poulton-le-Fylde, retired chemist, for many years in business in Bolton (net personalty, £1,779) £2,773

Mr. J. T. Arundel, of the Savoy Hotel, Bournemouth, largely interested in the Pacific Phosphate Co., Ltd. (net personalty, £245,610) £300,959

Dr. C. R. C. Lyster, of Frances Street, W., one of the pioneers in X-ray investigation £2,865

Mr. W. W. Fisher, F.I.C., of 5, St. Margaret's Road, Oxford, public analyst for Berks, Bucks and Oxon, a former President of the Society of Public Analysts... £15,155

The American Chemical Industry

(From Our American Correspondent)

March 15, 1920.

Contrary to the opinion expressed in my last letter, the Bill regulating the imports of dyestuffs from Germany has not yet been passed. The reason for this is the now almost intolerable delay due to the inability of the Senate to agree on the terms of the Peace Treaty. The leaders of the dye stuff industry have been assured that with the Peace Treaty out of the way precedence will be given to the Bill guaranteeing protection for a period of three years to all dyestuffs and intermediates at present manufactured here at a reasonable profit.

A recent discussion on cellulose at the New York Section of the American Chemical Society disclosed the fact that there is practically no college or university to which a student can be sent for the purpose of receiving a thorough course of instruction in the fundamental properties of cellulose and its derivatives. Attention is being focused on such points as this, and there is considerable ground for assuming that in the near future active steps will be taken towards the erection of a National Institute for Research in Pharmacology in Washington, D.C. It is anticipated that this will be the forerunner of a series of such institutions comprising a National Institute for Scientific Research.

The Nichols Medal was awarded to Dr. Irving Langmuir at the last meeting of the American Chemical Society for his work on "The Octet Theory of Valency." In accepting the gift he paid a tribute to the ideas and inspiration derived by him from the previous work of Dr. Gilbert Lewis of California. This new theory—and it seems to be generally agreed that we are indebted to Lewis for a statement of the first general principles—has been developed by Langmuir in a most interesting manner, and English readers will find much of interest in his communications appearing in recent numbers of the American journals.

A further item of interest, especially to members of the Faculties of the various colleges and universities, was the statement by Dr. Nichols, President of the General Chemical Co., made at the same meeting, that one of the problems causing the industry very serious concern at the moment was the more than probable decrease in efficiency of university teaching in the near future, if salaries were not paid of a character sufficient to attract the right type of mind. He stated that a scheme had not been worked out, details of which were to be published shortly, in which the industry was to play a prominent part in assisting the universities to meet the increased financial demands made upon them owing to the general increase in the cost of living.

There would seem to be general indications of an awakening on the part of the larger corporations that in having withheld information of general scientific value they have in a measure only served to cripple the industry. Thus, the Barrett Co. is publishing the results of considerable new research, and A. D. Little Inc., of Boston, is doing useful work in compiling for general information a bibliographic series of booklets comprising complete abstracts of the literature in various fields, such as "Production of Alcohol from Sulphite Waste Liquors," "Chemical Warfare," "Industrial Research," &c.

The question of nitrogen fixation is still one of prime importance, as is shown by the recent amalgamation of the General Chemical and Semet Solvay Companies, whereby the Haber Ammonia process is to be operated in connection with the Solvay Soda process on the lines suggested by Claude in *Chimie et Industrie*, August, 1919. It cannot be gainsaid that there exists in America a considerable body of expert opinion still firmly convinced that the arc process of nitrogen fixation will sooner or later dominate the field, and the recent interesting communications of Dr. Steinmetz in *Chemical and Metallurgical Engineering* would appear to indicate certain valuable lines along which progress may be expected. In other words, it is far too early yet to assume that the Haber process represents finality in this matter.

In view of the progress made in connection with experiments on surface combustion in England, it is curious that so little is known here regarding this work, as there would seem to be a large field in this connection.

India's Chemical Industry

Engineering Plant Needed

The Indian chemical industry, from which so much is expected and in which great developments are possible, is in need of up-to-date chemical engineering plant and appliances.

Amongst the requirements, according to the *Times Trade Supplement*, may be specifically mentioned mild steel autoclaves, high pressure, with and without agitators, stills and condensers, mild steel air receivers, evaporators, acid-resisting ware, silicon-iron tanks, vessels and containers, acid-resisting valves and fittings, crushing and grinding machines, vacuum pans, retorts, jacketed pans, &c. Indian chemists are now at work on the following problems, amongst others: Colloidal medicinal preparations, the preparation of suitable chromate from chrome iron ore without the use of caustic soda or sodium carbonate, the purification of various local oils, the manufacture of acetone by the fermentation process from cholam and jawri, the production of caustic soda, ammonia, and the various ammonia salts, and the production of sulphuric acid on a large scale. With regard to the latter it is felt that the existing supply will be considerably augmented when the smelting of Burmese zinc ore is carried out on a sufficiently large scale in the Bengal Presidency.

At the present time alcohol, refined petroleum, many of the belladonna preparations, tannin and gallic acid, salicylic acid, and its salts, and a number of the coal tar derivatives are being made in India. As regards the latter, however, the yield of tar from Indian coal is comparatively low. Tar of fair quality is being obtained from coke ovens, and moderate supplies of ammonium sulphate and other ammonia compounds are obtained as by-products at the big works of the Tata Steel Co. The yearly production of coke-oven by-products by this company, when the whole of the plant is completed, is expected to be 2,300,000 gallons of crude naphtha, 10,000 tons of sulphate of ammonia, and 40,000 tons of tar. The large amounts of benzole, toluol, naphtha and creosote from these works alone open up vast possibilities for development in chemical manufacturing, and such success would undoubtedly stimulate chemical work in other directions provided the necessary plant can be obtained.

Alkali Production

New chemical industries are to be established near Bombay, the chief scheme in connection with these being the utilisation of the alkali deposits at Kharaghoda. A magnesia company has already improved and extended its premises there, and has installed a railway siding and loading platforms, and according to advices just to hand is arranging to purchase a motor rail wagon with tank and pump for the purpose of bringing the crude bittern from the pans to the factory. An improved process of manufacture has been devised and the company is about to experiment on a large scale in connection with the manufacture of magnesium chloride and magnesium sulphate by the new method. The objects of the new process are said to be a greatly improved production of the former with economy of fuel and an increased recovery of by-products of good quality.

The new experimental plant is practically ready and work will be begun at the earliest possible moment. Should the experiments prove successful, regarding which there is little doubt, a good deal of chemical engineering plant will be required. The by-products, it appears, will be obtained by treating the sludge from the chloride vats with sulphuric acid, so as to convert the chloride in the sludge into practically pure magnesium sulphate, and the hydrochloric acid set free in this process will be utilised for the production of zinc chloride. Experiments are also being carried out with the object of testing the bittern as a possible source of bromine. Similar investigations are to be instituted regarding the possibilities of manufacturing magnesium salts and extracting bromide at Aden. In regard to this the opinion is generally held that the establishment of a bromine and bromide industry in this part of the Empire will probably depend more upon Imperial policy than on industrial and commercial factors.

Superphosphates

Potash production is a fairly old established Indian industry, and in the last 10 years the yearly production has varied between 15,000 and 25,000 tons. This yield might be increased by the adoption of improved plant and the concentration of the salt manufacture, as well as by the recovery of potash from the mother liquors and from the blast furnace gases. Nothing has as yet, however, been done in those directions. So far no good quality of phosphate of lime has been found in India suitable for the production of superphosphates, most of the phosphate having been found in the form of nodules containing a high percentage of carbonate. These, consequently, are unsuitable for the usual sulphuric acid treatment. The deposits of mixed phosphates of lime and aluminium found in parts of Bengal are also not suited for the acid treatment. There are, however, particularly rich and suitable deposits along the Red Sea which could be shipped to the west coast ports, and these would supply all or, at any rate, a large part of the demand, provided suitable plant were obtainable and ample supplies of sulphuric acid were forthcoming.

The Chemistry of Tanning

Annual Meeting of the Nottingham Section

AT the annual meeting of the Nottingham Section of the Society of Chemical Industry, held on March 31, the election of officers and Committee for the ensuing year was announced as follows :—

Chairman : J. H. Dunford.

Vice-Chairman : S. R. Trotman and J. T. Wood.

Members of Committee : C. L. Archbutt, S. F. Burford, B. Collitt, R. Duncalfe, F. S. Kipping, D. J. Law, A. G. C. Paterson, A. D. Powell, E. B. R. Prideaux, H. D. Richmond, W. P. Skertchley and J. White.

Traditional Processes of Tanning

Mr. J. J. Wood then read a Paper on the " Chemistry of Tanning," dealing especially with chrome tanning and other recent developments.

The traditional processes of tanning had continued for at least 3,000 years almost unchanged in essentials and were also similar to those in use among primitive peoples at the present day. Although so well known empirically, they were excessively complex chemically, but had been somewhat elucidated by the theories of colloid chemistry. The preparatory processes were perhaps even more important than the actual tanning, but dealing only with the latter in the present Paper the lecturer considered the prepared skins as consisting almost entirely of a mass of fibres, the complex protein collagen which had been represented broadly as $R\begin{cases}NH.\\ |\\ CO\end{cases}$ When boiled, as for glue, this was hydrodysed and the closed ring was opened up. In the soluble condition as glue or gelatine it might be precipitated by gallotannic acid, probably owing to the neutralisation of the charges on the two oppositely charged colloids. This precipitation was somewhat similar to what occurred in tanning, which might be carried out with the use of many colloids, including gold *sol*, although to give a really stable leather combination must occur subsequently between the collagen and the tanning agent—gallotannic, silicic or stannic acids or basic chromic sulphate. In silica tanning, silicic took the place of gallotannic acid, the equivalent weight of the former acid required being even greater than that of the latter. The finished leather was white and might contain about 24 per cent. of silica.

The one-bath and two-bath processes of chrome tanning were explained and elucidated by equations. In the former, chromic anhydride liberated in the skin from sodium dichromate and hydrochloric acid was reduced by sodium thiosulphate with the formation of a variety of products—tetrathionate, sulphate, sulphur dioxide and sulphur, which remained to some extent in the leather, and basic chromic sulphate the tanning agent. In the one-bath process the dichromate was reduced by glucose and sulphuric acid, or, according to the suggestion of Procter, by sulphur-dioxide, then converted into the basic chromic sulphate by the addition of alkali, after which the skin was introduced.

Discussion

In answer to Mr. Innes, Mr. WOOD said that it was possible to prepare identical leathers by the two processes. Mr. Innes mentioned that he had always found a higher ratio of acid to chrome in leather tanned by the two-bath process. The presence of arsenic in the acid, although it somewhat modified the reactions, had no bad effect on the finished leather. He had sometimes noticed a red colour on adding to the thiosulphate an arsenical hydrochloric acid. This appeared to be due to the simultaneous presence of arsenic, copper and iron.

Mr. RICHMOND made some comments on the proteins present in collagen. He was surprised to hear that only 45 per cent. had been accounted for as decomposition products of definite composition. In the case of casein the known decomposition products amounted to 85 per cent. of the whole, including all the amino and carbonyl groups. He asked whether formaldehyde could be used in tanning. Mr. Wood replied in the affirmative, provided a strongly alkaline solution was used which opened up the protein molecule. In answer to Mr. Pentecost, the gloss on leathers was produced by mechanical means, except in the case of patent leathers, which were varnished with a celluloid mixture.

THE DEATH IS ANNOUNCED of Bailie Andrew Fisher, of Paisley, well known in the Glasgow and West of Scotland chemical trade, who in 1868, in company with his late brother, founded the engineering business of Fisher's, Ltd.

MR. GEORGE DOUGLAS, managing director of the Bradford Dyers' Association, last week opened premises at Cambridge House, Horton Lane, Bradford, as the headquarters of the Staff Guild. Membership of the Guild is open to foremen and the technical and clerical staff of the Association, and Cambridge House has been fitted up and furnished as a first-class club. Mr. W. H. Easton (chairman of the Guild) presided, and among those present, besides Mr. Douglas, were Mr. James Sharp and Mr. H. Sutcliffe Smith (executive directors) and Mr. T. D. Buttercase (labour director).

Society of Dyers and Colourists

Annual Meeting of West Riding Section

MR. JOHN C. OXLEY presided over a large attendance of members at the annual meeting of the West Riding of Yorkshire Section of the Society of Dyers and Colourists, held at the Midland Hotel, Bradford, on Wednesday, March 31.

Mr. G. G. Hopkinson (hon. secretary), in presenting the annual report, said the past year had been a very successful one. During the summer months visits had been made to various works in the West Riding, and also in the metropolis. Throughout the winter great interest had been taken in the lectures delivered fortnightly by well-known men in the chemical and dyeing trades. Successful meetings had also been held in Leeds and it was proposed to give lectures there during the coming winter. There was a large increase of membership during the year. The junior section alone showed an increase of 116. Visits to works were being arranged for the summer, and a new feature would be an outing to which ladies would be invited.

The resignation of Mr. Oxley, as chairman of the section, was reluctantly accepted. It was felt that his position would be difficult to fill as he had held the office for many years, and filled it with singular tact and goodwill.

Mr. Hopkinson was re-elected hon. secretary, and Mr. Oxley was elected to serve on the committee in addition to Messrs. F. Smith, H. H. Bowen, J. H. Dunnington, W. P. Walker, P. Pomphrey, D. McLlellan, H. Jennings, A. C. Wilkinson, R. Turner, G. A. Blakey and Dr. S. A. Shorter.

A scheme for forming, in Bradford, a West Riding Sectional Club, was considered and it was pointed out that the club might be of great commercial, educational and social value and could be used as a meeting place where business could be transacted. It was unanimously decided to go forward with the scheme.

New Rubber Research Association

Mr. B. D. Porritt Appointed Director of Research

MR. B. D. PORRITT, M.Sc., F.I.C., F.R.S.E., has been appointed Director of Research to the recently formed Research Association of British Rubber and Tyre Manufacturers.

Mr. Porritt studied chemistry at the University College, London, under the late Sir William Ramsay, from 1903. He graduated with honours in the University of London, and thereafter took up chemical research work concurrently with a course of bacteriology at University College Hospital Medical School. In 1908 he relinquished his work, and accepted an appointment as chemist to the North British Rubber Co., Ltd., at their works at Edinburgh. Their extensive and well-equipped laboratories were built up under his direction, and the staff, which originally consisted of one chemist, now comprises twelve fully-qualified men and more than double that number of assistants. Mr. Porritt has contributed to a number of scientific and technical journals, and is the author of an excellent book on " The Chemistry of Rubber."

The investigations in connection with the manufacture and testing of balloon fabrics carried out by Mr. Porritt and his staff prior to the war proved of great value, and the organisation and equipment of the aeronautical laboratory at the Edinburgh works later supplied the model from which the War Office Aircraft Fabrics Department at Manchester was evolved.

Mr. Porritt is a member of the Council of the Institute of Chemistry and the Composite Materials Panel of the Electrical Research Committee. He is also serving on the committees of a number of other scientific societies.

Catalysis and Oxidation of Oils

DR. R. S. MORRELL (Wolverhampton) contributed a Paper at the recent meeting of the Birmingham and Midland Section of the Society of Chemical Industry on Catalysis applied to the oxidation of oils. He pointed to the complex constitution of oils, and laid stress on the great variety of changes that took place during oxidation. In the oxidation of linseed oil he favoured the view of polymerisation accompanying the formation of peroxides. He laid stress also on the necessity of considering the interfacial tensions of drying oil films to air, water and nitrogen.

Dr. Morrell gave results of measurements of surface tension of metallic drying oils, showing that lead differed markedly from cobalt and manganese in superficial properties. By the application of Gibbs' rule differences between the three metals as driers could be explained which were unaccountable under Engler's intermediate compound theory, or by explanations such as advanced by Rochs. He urged that more attention must be paid to the study of the catalytic oxidation of oils from the standpoint of interfacial forces, whereby connection might be established between these and the chemical changes which were known to occur during the drying and setting of oils.

Chemical Matters in Parliament

German Potash Contract

In reply to Sir R. Cooper, who asked the Chancellor of the Exchequer (House of Commons, March 31) what was the value of the food supplied to Germany that had been specially allocated against the potash contract entered into with the German Government by the Board of Trade representatives, Mr. Chamberlain stated that the sum credited to Germany under this contract amounted, up to March 30, to £612,838. The Government had agreed to place the amounts due to Germany under the contract to the credit of the German Government in a London Bank on the receipt of an undertaking that the money would be used for the purchase of food in this country, and were awaiting an undertaking to this effect.

Scottish Slag Cement

Mr. Gideon Murray asked the Secretary for Scotland (House of Commons, March 31) whether he was aware that Scottish slag cement was procurable at a price of about £2 per ton less than English cement; that this slag cement was quite suitable for use in the construction of the foundations of houses being built in Scotland; and whether he would arrange with the Director of Supplies that this cement be placed at the disposal of Scottish local authorities, some of which had based their estimates upon the lower cost of the Scottish cement?

Mr. J. Hope: I have been asked to reply. The reply to the first two parts of the question is in the affirmative. With regard to the third part of the question, the only two slag cement firms in Scotland were both approached without result in October last for the supply of materials for the Government Housing Schemes. One of the firms was unable to accept orders, owing to its entire output being booked for months ahead, and the other firm was suffering from the effects of a collapse of its kilns. Nogotiations have now been resumed with these firms and it is hoped that a definite proportion of the output of slag cement will be secured for housing in Scotland.

Glass Research Appointment

Mr. H. Fisher, in reply to questions (House of Commons, March 31) by Mr. Acland regarding the recent appointment to the directorship of research to the Glass Research Association, stated: The dissatisfaction expressed by certain scientific workers with the appointment of the director of the Glass Research Association has been brought to my notice. I understand that this association, after making careful inquiry into the qualifications of the various applicants for the post, considered that the successful candidate, who, I am informed, has a wide and successful experience of scientific research into the problems of the glass industry, was the man best suited for organising and directing the research needed by the association. The responsibility for the selection of a director of research rests in each case with the research association concerned, and not with the Department of Scientific and Industrial Research, who have no power to approve or disapprove the appointment of any individual, since the only possible basis for the establishment of research associations is to leave to the industry concerned the selection of the officers required to carry out the duties and responsibilities falling to the association. In this case the Department guarantees three-quarters of the expenditure of the research association up to a certain limit, but payment of the grant is conditional, among other things, on the approval by the Department of the programme of research and of the estimate of expenditure thereon. I may say that the Advisory Council of the Department, which, as the hon. member is no doubt aware, is almost entirely composed of persons of the highest scientific standing, after considering all the relevant circumstances with great care, recommended the approval of the expenditure involved in this director's appointment. I am satisfied that the conditions under which grants are made to research associations provide an adequate guarantee that the State funds intended for the encouragement of scientific research for the benefit of the industries will be wisely expended.

Petrol and Benzol Prices

Mr. Morris asked the President of the Board of Trade (House of Commons, March 30) whether he was aware that the report of the Sub-committee appointed to investigate petrol and benzol prices did not distinguish between crude benzol and refined motor benzol; that to produce 1 gallon of motor benzol it required 1·6 gallons of crude benzol; that the Sub-committee recommended the price beyond which crude benzol should not be sold at 1s. 4d. per gallon, and the equivalent cost of 1 gallon of refined benzol would be 2s. 1½d. per gallon; that 6½d. per gallon was the cost of refining, and 5d. per gallon was the value of the residuals, leaving net cost of 1 gallon at 2s. 3d.; that the cost of distribution and garage profit equalled 9½d., bringing the total cost to the public to 3s. 0½d.; and that the maximum sale price recommended by the committee was 2s. 8d. per gallon, showing a loss of 4½d. per gallon; and what steps would be taken to protect the producers and distributors of this home-produced fuel from the above-mentioned error and prevent the sellers of benzol from being prejudiced in the eyes of the public?

Mr. Bridgeman: Representations have been received from the National Benzol Co. to the general effect indicated in the question. The matter is still under examination.

Chemical Trade Inquiries

Locality of Firm or Agent.	Materials.	Ref. No.
Australia (Melbourne)	Glassware	432
British India (Karachi)	Chemicals and Dyes	434
Canada (Toronto)	Essential Oils, Acids, Gums, &c. ...	435
Czecho-Slovakia...	Oils, Leather	443
France (Paris) ...	Chemical Products	447
(Paris, with connections in Lille, Lyons, Bordeaux and Marseilles.)	Chemical Goods	448
(Lyons) ...	Chemical Products used in the dyeing industry	448A
Spain (Madrid) ...	Chemicals	453
Switzerland ...	Edible Oils; Drugs	455
(Zurich) ...	Heavy Chemicals	454
Philippine Islands (Manila)	Glassware	462
Mexico	Material for the soap industry, especially silicate of soda	465
South Africa ...	(6) Engine and Lubricating Oils ... 2,400 gallons of good medium-bodied engine lubricating oil, in 5-gallon drums. 1,500 gallons of good heavy type steam cylinder oil, in 5-gallon drums.*	—
Canada (Calgary)	Druggists' Sundries	468
Canada	Chemical Products for rubber ...	471
Italy (Milan) ...	Pharmaceutical Products	486

* Tenderers should state specific gravity, &c., of oils they are prepared to supply. Drums should be of good stout metal fitted with a screwed and capped outlet. The weight of drums should be stated. Quotations to be at per gallon (inclusive of drum) f.o.r. in bond. Delivery to be made as follows: 1,500 gallons of engine lubricating oil, 900 gallons cylinder oil; f.o.r. in bond, Delagoa Bay; and 9,000 gallons engine lubricating oil, 600 gallons cylinder oil; f.o.r. in bond, East London. The approximate date of delivery, after the acceptance of tender to supply should be stated. The Department of Irrigation will furnish certificates to release the oil from bond at the ports.

Sealed tenders will be received by the Chairman of the Union Tender Board, Union Buildings, Pretoria, up to 3 p.m. on May 19.

Specifications, tender forms, &c., and any further particulars may be obtained upon application to the Director of Irrigation, Union Buildings, Pretoria.

The British Chemical Trade Association

The Association has received inquiries for monomethylamine in cylinders. Members interested should communicate with the Association.

Chemical Engineering Group

Another stage of development in the history of the Chemical Engineering Group of the Society of Chemical Industry is indicated by the announcement of the first annual dinner of the group. This is to be held on Thursday, April 15, at the Waldorf Hotel, Aldwych, W.C.2, with Dr. E. F. Armstrong, F.R.S., vice-chairman of the group, in the chair. Inquiries may be addressed to the Hon. Secretary, 24, Buckingham Street, Strand, W.C.2.

The dinner will be preceded by the annual meeting at 6.30 in the same hotel. The third conference of the group have been arranged for Friday, April 23, at Birmingham, when the subject will be "Labour-Saving Devices in Chemical Works," and the date of the fourth conference is Wednesday, July 4, and the subject of discussion "Filtration."

From Week to Week

DR. M. MAYER, of the Auer Co. in Berlin, has been appointed to the chair of chemistry in the Karlsruhe Technical High School.

DR. EDGAR F. SMITH, who has made notable contributions to electrolytic analysis and the analysis of minerals, has tendered his resignation as provost of the University of Pennsylvania.

DR. D. S. PRATT, formerly assistant-director of the Mellon Institute in the University of Pittsburgh, died on January 28. His chief work was on phthalic acid derivatives, and he was a recognised authority on the chemistry of tropical products.

MR. FRANCIS H. CARR, who has been appointed a Commander of the Order of the British Empire in recognition of services rendered in connection with the war, has resigned his position with Boots' Pure Drug Co., and is now a director of the British Drug Houses, Ltd.

MR. ARTHUR R. LING, consultant in applied chemistry and lecturer in brewing at the Sir John Cass Institute, London, has been appointed to the Adrian Brown chair of brewing at Birmingham University.

THE DEATH IS ANNOUNCED of Dr. C. A. von Martins, in his 83rd year. Dr. von Martins was one of the founders of the German coal-tar dye industry and a director of the Aktien-Gesellschaft für Anilin-Fabrikation in Berlin.

PROFESSOR C. H. DESCH, who has been appointed to the Chair of Metallurgy in the University of Sheffield, was last week presented by the instructors and students of the evening classes of the Royal Technical College, Glasgow, with a suit case, to mark his departure from the college.

MR. A. WILKINSON, a dyer at the works of J. C. Waddington & Sons, dyers, Crown Point, Leeds, with whom he has served for 50 years, was last week presented with an umbrella by his fellow employees, and a logwood stick and a cheque from his employers in celebration of his industrial jubilee.

AT THE INQUEST at Huddersfield last week concerning the death of Thomas Jenning, a filter press cleaner in the methyl blue department of British Dyes, Ltd., it was stated that death was due to heart failure following bronchial pneumonia, brought about by the inhalation of some irritant gas. A verdict in accordance with the medical evidence was returned, with the qualification that death was accidental.

AFTER MONTHS OF DELAY, the first consignments of German dyes, sent to this country under the reparation clauses of the Peace Treaty, have reached the Yorkshire woollen manufacturing districts. Each firm of users which applied for a share has received supplies in proportion to its pre-war consumption. The dyes are said to be of excellent quality, comparing favourably in price with the British and Swiss products.

WEST GERMAN NEWSPAPERS report that the Elberfeld Dye Co., which during the war laid down large plant for the production of artificial rubber, will shortly begin producing on a commercial scale. The company possesses several patents, the most valuable of which are based upon acetone. Germany, shortly before the armistice, was equipped to produce 300,000 lb. of synthetic rubber per month. The German War Department used it mixed with old natural rubber. The present German output capacity of synthetic rubber is stated to be 420,000 lb. per month.

PROFESSOR H. E. ARMSTRONG, in a letter to the *Times* of Thursday, gives an interesting review of the prospects of the indigo industry in Bengal, and states that the progress made during the last 18 months has been so substantial and encouraging that success may now be regarded as assured. He has recently had the opportunity of discussing the question with Mr. Davis, the Indigo Research Chemist at Pusa, and they agree that the chief need of the industry is an adequate supply of phosphate manures. As, however, sulphuric acid will soon be available in large quantities in India, it is anticipated that this need will soon be met.

EVIDENCE of the good feeling existing between employers and the employed in the chemical industry was forthcoming at a meeting at Cardiff on Thursday of the West of England and South Wales Section of the Joint Industrial Council of the industry. Mr. Charles Eden, of Vivian & Sons, Swansea, chairman of the Council, who presided, was unanimously requested by the labour representatives to continue in office for another year, although the custom is for the chairman one year to be a representative of the employers' side and next year of the employees'. Mr. G. A. Knowles (Cwmbran) and Mr. David Bonham (Dockers' Union) were re-elected joint hon. secretaries.

THE OLD-ESTABLISHED FIRM of John Ismay & Sons, of Newcastle-on-Tyne, has sold its premises to Mr. Angus Watson, as representing, it is understood, one of Lord Leverhulme's interests. Mr. F. Gilderdale, F.C.S., assistant manager and chemist to Ismay's, has joined the directorate of a newly-established firm on Tynesdale, Copeland & Wilson, Ltd. This firm has recently acquired the business of Currie & Hutchinson, manufacturing chemists, of Newcastle, who were founded in 1741. The name of the firm will be continued, but Mr. Gilderdale will give personal supervision to it. The directors of Copeland & Wilson, Ltd., are Mr. Sydney Walton, C.B.E. (chairman), Messrs. F. Gilderdale, George C. Wilson and Harold Copeland.

Growth of French Chemical Industries

THE figures quoted below from the *Board of Trade Journal* give some idea of the increase in the productive capacity of France during the war in chemical products other than fine chemicals :—

	1913.		1919.	
	Production. Tons.	Consumption. Tons.	Production. Tons.	Consumption. Tons.
Sulphuric acid—58	1,100,000	1,172,500	2,500,000	1,500,000
Sulphuric acid—66 ...	58,000	58,000	1,200,000	Nil.
Oleum (fuming sulphuric acid) ...	6,000	6,000	300,000	25,000
Nitric acid	20,000	18,500	360,000	20,000
Sodium salts	625,500	506,000	800,000	650,000
Liquid chlorine ...	300	Nil.	90,000	15,000
Bromine	Nil.	100	500	200
Calcium carbide ...	32,000	28,000	200,000	—
Calcium cyanamide ...	7,500	8,000	300,000	—
Ammonium salts ...	75,000	95,000	200,000	150,000
Nitrate of lime ...	Nil.	9,500	250,000	250,000
Natural phosphates ...	2,700,000	1,220,000	3,000,000	2,700,000
Superphosphates ...	1,965,000	1,900,000	2,500,000	2,500,000
Phosphorus	300	30	3,600	—

Great strides have also been made in the manufacture of synthetic products, an impetus having been given by the requirements of the war. It remains, however, to be seen, states the *Journal Industrielle*, whether the efforts already made will continue, as American competition on the French market may have disastrous results for the future of the French fine chemical industry. The poor development of this industry before the war is attributed to the condition of patent legislation and technical instruction, and to the Customs Tariff. The Customs Law of 1892 established a tax of 1 franc per kilo on all artificial colouring matters, and of 15 centimes on intermediates. As a result of this, the Germans established in France factories for the manufacture of the finished products from the intermediates, and thereby killed French initiative. Technical instruction, too, is still insufficient, though France ranks behind only Germany and Switzerland. What is required above all is a school where the chemist and the engineer may complete their technical education. This school must be the factory itself. And it is not to be expected that a whole generation of industrial chemists and chemical engineers, capable of rendering services comparable with those of their German colleagues, trained in an industry already well established, can be created at one stroke. In France, up to the present, the measures proposed for the protection of the industry consist essentially in the revision of the Customs Tariff as regards chemical products, which, on September 16, 1919, reached the stage of being passed by the Chamber of Deputies. The new legislation approximates in part to the United Kingdom practice in regulating the importation of dyes and coal-tar products.

The Future of the Nitrogen Industry

AT the ordinary general meeting of Rosario Nitrate held on March 31, Mr. T. V. Anthony, who presided, dealt briefly with the future of the nitrogen industry. "In so far as the requirements of the present agricultural season in Europe can be gauged," he said, "there is every reason to think that the estimates formed some time back will be more than justified, always provided that the nitrate is available. In the United States the consumption promises to be very heavy, and a most encouraging feature is the persistent demand for nitrate in the East. It would be folly to attempt to ignore the future possibilities of the atmospheric nitrogen industry. I say 'future' advisedly, because there is little fear that for some time to come synthetic nitrogen production will develop in proportion to the demand for fertilisers throughout the world. The food supply is dependent to a very large extent on the supply of nitrogen, and as the world grows older every source will be tapped in its turn. At present the two main producers of synthetic nitrogen are Germany and the United States—whatever Germany may produce will not be more than sufficient to supply her own needs for the next few years; at the moment she is inquiring keenly for nitrate of soda. In the United States millions of dollars were spent during the war on the erection of plants, some of which are on the way to completion, while others are hardly commenced, and it is clear that very little will be produced for the next year or two, and even then the estimated capacity is so moderate as to cause no misgivings to our industry. It must be remembered, too, that any new projects for the manufacture of synthetic nitrogen will have to face the tremendous increase in the cost of the erection of the necessary plant, an element of considerable importance, when it is remembered that even under pre-war conditions the cost of production was so dubious an item as to be studiously concealed. It behoves us to push on actively in our efforts to cheapen production, and to prepare ourselves for competition from whatever quarter it may come."

MR. C. T. HEYCOCK has been appointed president of Section B (Chemistry) at the meeting of the British Association to be held in Cardiff on August 24-28.

References to Current Literature

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Note on the Reichert-Meissl-Polenske method. H. D. Richmond and G. F. Hall. *J. Soc. Chem. Ind.*, March 31, 80T.

Sodium peroxide fusions. A. E. Musgrave. *J. Soc. Chem. Ind.*, March 31, 80-81T. A new fusion crucible is described.

CHARCOAL. The effect of heating on the absorptive power of sugar charcoal for sulphur dioxide. R. M. Winter and H. B. Baker. *Chem. Soc. Trans.*, March, 319-320.

COAL. The behaviour of the constituents of banded bituminous coal on coking. R. Lessing. *Chem. Soc. Trans.*, March, 247-256.

The mineral constituents of banded bituminous coal. R. Lessing. *Chem. Soc. Trans.*, March, 256-265.

COKING. Excessive moisture in washed coal and its effect on by-product coke ovens. A. H. Thwaite. *Gas World (Coking Sect.)*, April 3, 38-39. A Paper read before the Coke Oven Managers' Association on March 13.

COTTON. A new test for the detection of ligneous impurities in cotton and cotton waste for nitration purposes. F. L. Barrett. *J. Soc. Chem. Ind.*, March 31, 81-82T. The test involves the use of Malachite Green.

FUEL. A method of determining the relative temperatures of spontaneous ignition of solid fuels. F. S. Sinnatt and B. Moore. *J. Soc. Chem. Ind.*, March 31, 72-78T.

GAS. Heat conservation and water gas. E. G. Stewart. *Gas World*, April 3, 286-289. A Paper before the London and Southern District Junior Gas Association, March 26.

Estimation of benzole in coke oven gas and scrubbing oil. L. Shuttleworth. *Gas World (Coking Sect.)*, April 3, 43.

GERMANY. German stocks of reparation chemicals. *Chem. & Drug*, April 3, 74-76. The official list of stocks of pharmaceutical chemicals available for the Reparation Commission under the Peace Treaty.

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POWER. The production of power from blast furnace gas. S. H. Fowler. *Engineering*, April 2, 443-445. A Paper read before the Institution of Electrical Engineers on March 11.

TUNGSTEN. The present position of the tungsten industry. J. L. F. Vogel. *J. Soc. Chem. Ind.*, March 31, 103-104R.

VAPOUR TENSION. A new instrument for measuring vapour tension. H. Moore. *J. Soc. Chem. Ind.*, March 31, 78-80T.

WELTING. Welting power and its relation to industry. W. H. Nuttall. *J. Soc. Chem. Ind.*, March 31, 67-71T. The methods of determining welting power are discussed, and the applications of this property considered.

Colonial

CELLULOSE. The titration of cellulose. W. Qvist. *Pulp & Paper Mag.*, March 11 & 18, 261-262, 285-287.

COAL. Utilisation of waste coal. *S. Afr. J. Ind.*, February, 151-156. A discussion of the Report of the Fuel Research Board in the light of South African conditions.

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French

ANALYSIS. Volumetric determination of manganese. P. Nicolardot A. Réglade and M. Geloso. *Comptes. rend.*, March 29, 808-810.

BAKING POWDER. Chemical yeasts. A. Kling. A. Lassieur and L. Vernerd. *Ann. Falsif.*, January, 9-17. The composition, action and analysis of baking powders are discussed.

Chemical yeasts (baking powders). L. Weil. *Ann. Falsif.*, January, 17-21.

LUBRICANTS. The control of lubricating oils. R. Dubrisay. *Ann. Falsif.*, January, 25-33. The testing of lubricants is considered.

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Phenoltrisulphonic acid and its conversion into picric acid. M. Marqueryrol and P. Carré. *Bull. Soc. Chim.*, February 20, 199-204.

United States

ALCOHOL. Industrial alcohol under the new law and regulations. R. R. Tunison. *Chem. & Met. Eng.*, March 17, 513-518. The authorised uses of denatured alcohol are enumerated and formulæ given for its preparation.

ALUMINIUM. Aluminium rolling-mill practice. R. J. Anderson and M. B. Anderson. *Chem. & Met. Eng.*, March 17 and 24, 489-491, 545-550. An account of the properties of commercial pig and scrap, and of the types of melting furnaces used, &c.

ANALYSIS. The identification of phenols. J. A. Lyman and E. E. Reid. *J. Amer. Chem. Soc.*, March, 615-619. A number of phenols have been etherified with *p*-nitrobenzyl alcohol.

Investigations of the Kjeldahl method for the determination of nitrogen. J. K. Phelps and H. W. Daudt. *J. Assoc. Off. Agric. Chem.*, November, 218-220.

Notes on the use of potassium permanganate in the determination of nitrogen by the Kjeldahl method. W. Frear, W. Thomas and H. D. Edmiston. *J. Assoc. Off. Agric. Chem.*, November, 220-224.

A simple, rapid method for the determination of halogen in organic substances. W. A. Van Winkle and G. McP. Smith. *J. Amer. Chem. Soc.*, March, 333-347.

Analytical weighing. H. L. Wells. *J. Amer. Chem. Soc.*, March, 411-419. Arguments against the use of long swings are advanced.

CATALYSTS. The effect of surface oxidation on some metallic catalysts. F. F. Rupert. *J. Amer. Chem. Soc.*, March, 402-411.

CHARCOAL. Some properties of charcoals. H. E. Cude and G. A. Hulett. *J. Amer. Chem. Soc.*, March, 391-401. Absorption under varying conditions has been studied.

Some aspects of the behaviour of charcoal with respect to chlorine. G. S. Bohart and E. Q. Adams. *J. Amer. Chem. Soc.*, March, 523-544.

EDUCATION. The need of co-operative educational work in the chemical industry. J. G. Cohen. *Chem & Met. Eng.*, March 17, 509-512.

ENAMEL. The manufacture of enamel-lined apparatus. E. P. Poste. *J. Amer. Ceram. Soc.*, December, 944-976. An interesting illustrated account of the making and uses of enamelled ware.

FILTERS. A classification of filter plates and frames and their general usage. D. R. Sperry. *Chem. & Met. Eng.*, March 17, 493-496. A useful paper.

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HEAT. Double-pipe heat interchangers. G. A. Richter. *Chem. & Met. Eng.*, March 24, 551-556.

LITHOPONE. Making lithopone at Collinsville, Ill. C. H. Jones. *Chem. & Met. Eng.*, March 17, 497-500. An illustrated account of the plant and process.

NITROGEN. Political and commercial control of the nitrogen resources of the world. C. G. Gilbert. *Chem. & Met. Eng.*, March 17 and 24, 501-504, 557-559. These conclude the article already noted (CHEM. AGE, 1920, 359).

PIGMENTS. Fineness and texture of pigments. H. A. Gardner. *Circ.* 90, *Paint Manufrs. Assoc., U.S.*, 6 pp. A new method of examining pigments is outlined.

German

ANALYSIS. Gravimetric estimation of molybdenum as sulphide. J. Sterba-Böhm and J. Vostrebal. *Z. anorg. Chem.*, February 24, 81-103.

Estimation of sulphuric acid. L. W. Winkler. *Z. angew Chem.*, March 9, 59-60. The estimation as barium sulphate is discussed.

Influence of degree of subdivision on melting point. F. Meissner. *Z. anorg. Chem.*, March 12, 169-186.

ELECTRICITY. A new source of energy and its possible application in chemical industry. H. Plauson. *Chem. Zeit.*, March 23, 229-231. The possibilities of atmospheric electricity are discussed.

FUEL. Gaseous fuels in 1917-1918. W. Bertelsmann. *Chem. Zeit.*, March 25, 237-238. The literature on gas analysis is reviewed. (*See also* CHEM. AGE, 1920, 284, 359).

GASES. Purification of compressed and liquefied gases for laboratory purposes. L. Moser. *Z. anorg. Chem.*, February 24, 125-142.

LEAD CHROMATE. Lead Chromate. M. Gröger. *Z. anorg. Chem.*, January 16, 226-234.

MERCURY IODIDE. A colourless form of mercury iodide. G. Tammann. *Z. anorg. Chem.*, January 16, 213-214.

METALLURGY. Physico-chemical studies on the wasting process. Equilibrium in the system lead-sulphur-oxygen. W. Reinders. *Z. anorg. Chem.*, December 11, 52-62.

SPIRITS. Detection of wood spirit in potable spirits. P. Hasse *Pharm. Zentralh.*, March 25, 177-182.

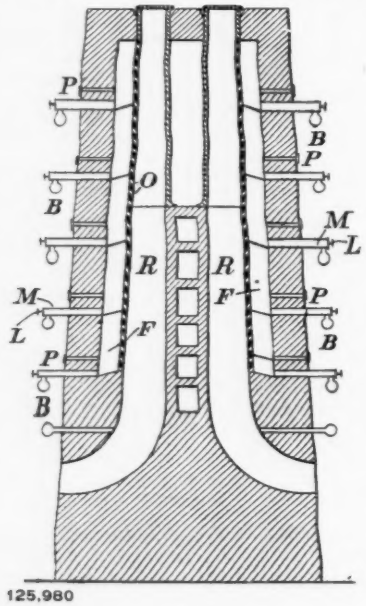
Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

125,980. Retort Ovens for the Distillation of Fuels and Bituminous Ores. E. Hauser, 33, Zorilla, Madrid, Spain. International Convention date (Spain), April 20, 1918.

A pair of vertical retorts R are arranged in a setting as shown, and one side wall of each retort is provided with closely-spaced apertures O in one of its walls which incline downwards from the exterior to the interior. The vertical flue F for collecting the gases extends along the perforated wall of the retort, and is divided into compartments or zones which slope downwards away from the retort as shown. Some of the apertures O may be horizontal in order to serve as sight apertures, and these are arranged opposite the openings P in the outer walls. The openings at the top of the retort may thus be used exclusively



125,980

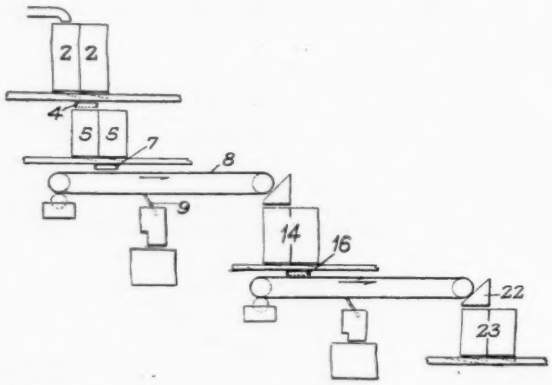
for charging. Each compartment of the flue F is provided with an off-take pipe M, controlled by a valve L and leading to a main B, which connects the discharge pipes of corresponding zones. The apertures O may be used for the injection at any desired zone of air, inert or reducing gas, or aqueous vapour. The products of distillation are withdrawn through the openings leading from other zones of the retort. A metal retort of this type may have its side walls extended into the surrounding casing so as to provide partitions for separating the distillation and heating gases.

137,811. Electrodes for Electric Furnaces. Det Norske Aktieselskab for Elektrokemisk Industri Norsk Industri Hypotekbank, Toldbodgaten 24, Christiania. International Convention date (Norway), January 17, 1919.

The object is to manufacture electrodes for electric furnaces from finely divided carbonaceous material, such as coke or graphite mixed with a binder, such as tar or pitch. The electrode comprises a metallic casing which is filled with carbonaceous material tamped into it, the whole being then heated to about 600°C. preferably in the furnace in which it is to be used, and finally baked at a higher temperature. A good electrical contact between the metallic casing and the core is obtained by providing the casing with radial ribs projecting inwards and provided with transverse projections a their inner ends. The electrodes are made continuously in the furnace as they are used up, by adding a section of the casing at the top and tamping the carbonaceous core into it. The casing is perforated to allow the escape of gas generated during the baking operation.

139,535. Ore Concentration. E. C. R. Marks, London. (From Luckenbach Processes Incorporated, 57, Post Street, San Francisco, Cal., U.S.A.). Application date, November 4, 1918.

The object is to separate metallic minerals or sulphides or sulphur or graphite from the associated gangue; the process is applicable to all ores and chemical compounds which can be concentrated by a flotation method, as well as to other mineral substances. The mineral selective agent used may be indiarubber in solution and may contain also an oleaginous or like material, such as copal, rosin, shellac, asphaltum, or pitch. The indiarubber is dissolved in a solvent, such as near-turpentine (*i.e.*, a petroleum distillate from which fat or grease has been removed), and petroleum grease is added to the solution in such proportions as to produce a viscous liquid. The mixture is placed on a continuously moving belt and the ore pulp is directed on to the surface from which the adherent



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mineral matter is subsequently removed. The ore pulp is delivered into a sieve 2 which removes a part of the mineral contents, and the pulp then passes through a foraminous distributor 4 to another sieve 5 which separates a further portion of mineral matter. The pulp then passes through a distributor 7 to a moving belt 8 coated with the mineral-selecting mixture. The moving member may alternatively be a rotating cylinder or table. The coating containing the mineral is removed by a scraper 9, and the tailings from the belt pass through a sieve 16 and distributor 14 to another moving belt 17 which discharges into a distributor 22, and thence to a sieve 23. Modifications in which a rotating cylinder or table are employed are described, and also a modification which does not involve the use of mechanically movable elements. The process permits the separation of mineral particles from ore which is less finely ground than is necessary with flotation methods. Further, the selective agent may be recovered.

139,578. Gas Producers. L. Fornas, 173, Boulevard Murat, Paris. Application date, February 13, 1919. Addition to 123,323, February 13, 1918.

The producer is more particularly for use with hard, dry fuel. The fuel is fed at the top of a casing and falls into a series of inverted perforated cones arranged in a horizontal plane. Each cone is immediately above an open-ended cylindrical furnace chamber, the adjacent chambers being separated by hollow walls containing water for the generation of steam.

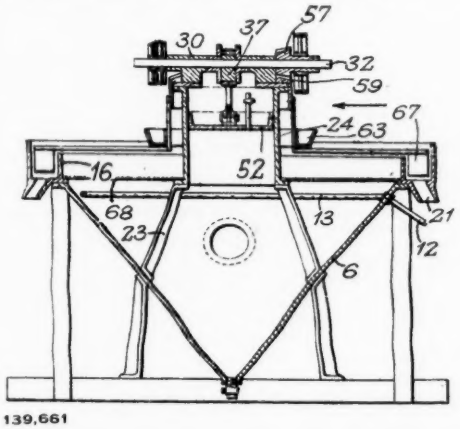
The steam is mixed with air and distributed by a perforated pipe into the space between the set of perforated cones and the top of the furnace chambers. The necessary air and steam for combustion and damping is thus introduced into the fuel before it enters the furnace chambers. The quantity of air and steam is regulated by a valve.

139,597. MIXING AND SIFTING POWDERED AND GRANULATED SUBSTANCES, APPARATUS FOR. B. Young, 4 and 8, Arthur Street, King William Street, London, E.C. Application date, February 26, 1919.

The materials are mixed in a horizontal trough provided with a rotating worm at the bottom and are then forced through a grating into a receptacle below, which is provided with a horizontal rotating brush which rotates in contact with the bottom of the receptacle which forms a sieve. The sifted material falls into another receptacle below in which it is subjected to another mixing by means of a horizontal rotating worm. The driving mechanism and the method of adjustment of the brushing and mixing devices are described in detail.

139,661. SEPARATING MINERALS FROM ORE-BEARING MATERIALS, MACHINE FOR. R. P. Park, 317, City Road, South Melbourne, Victoria, Australia. Application date, April 14, 1919.

The mineral is separated from other materials by washing in the conical tank 6. The tank is filled with water by means of the pipe 12, which is connected to the perforated pipe 13 so that the sides of the tank may be washed down. A vertical cylinder 24 is supported from the tank by means of the brackets 23, and a permanent volume of air is enclosed in the lower part of the cylinder between the piston 52 and the liquid into which the lower end of the cylinder dips. The upper end of the cylinder carries bearings 30 for the main driving shaft 32 which carries an eccentric 37. The eccentric strap is connected to



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the piston 52 so that the latter is reciprocated, and a pulsating pressure is transmitted to the surface of the liquid in the tank 6. The liquid is caused to surge upwards through the solid material on the grating 68 so as to wash the lighter material over the circular wall 16 into an annular channel along which it is moved by rotating scrapers 67 to the exits 21. The heavier mineral passes through the grating 68 into the tank 6 from which it is recovered through the valve 8. A control valve is provided to regulate the compression of the air by the piston 52, and consequently the extent of movement of the liquid. The material to be treated is fed into the trough 63 which is rotated by the pinion 57 and toothed ring 59, which are driven independently of the shaft 52. The material passes through perforations in the trough 63 during its rotation, and falls on to the grating 68.

139,731. GAS PRODUCERS OR CARBONISING PLANTS, FURNACE GRATES, FOR USE WITH. J. Wells, 36, Sharia Falaki, Cairo, Egypt. Application date, September 19, 1919.

The grate of the producer is inclined, and is carried by a rectangular frame which is supported on horizontal pivots at its upper and lower edges. The lower pivot may be adjusted horizontally so as to vary the opening between the grate and the lower edge of the producer wall, and thus vary the discharge passage into the ashpit. The upper pivot may be adjusted in position so as to vary the inclination of the grate. The side members of the grate frame are extended beyond the lower pivot and carry balance weights. Rotating paddles are mounted adjacent to the lower end of the grate to facilitate the discharge of ashes from the producer.

NOTE.—The following specifications which are now accepted and published were abstracted when they became open to inspection under the International Convention : 130,963 (C. Rossi), relating to fertilisers made from natural rocks ; and 132,245 (Chemische Fabrik Flora), relating to preparation of halogen-isobutylacetic acid, &c. (*See* THE CHEMICAL AGE, Vol. I., pages 504, and 603).

International Specifications Not yet Accepted

138,115. PURIFYING OILS, &C. V. Schwarzkopf, Bremen, Germany. International Convention date, October 23, 1918.

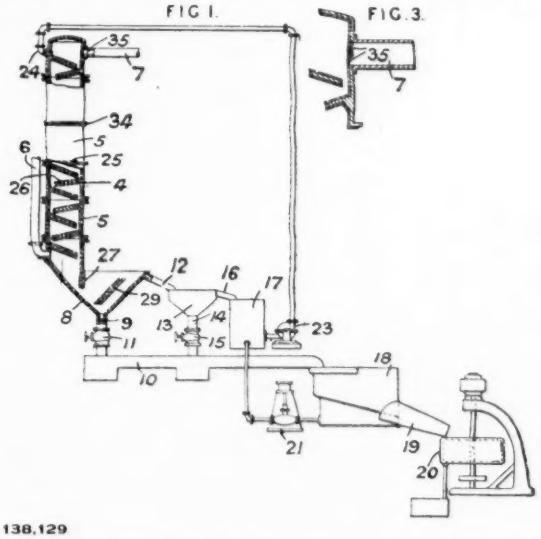
Oil or fat, *e.g.*, rape-seed oil, is bleached and refined by treating it with "tonsil" or "panconite" in a current of hydrogen for four to five hours at a temperature which is gradually raised to 250°C. The product is particularly suitable for hardening by catalytic means.

138,116. CELLULOSE COMPOUNDS. Deutsche Celluloid Fabrik Eilenburg, Germany. International Convention date, January 9, 1918.

Cellulose is mercerised in alcoholic soda lye and then removed and treated with mono-chloracetic acid. After the completion of the reaction water is added to form a thick paste which is then neutralised and the cellulose compound precipitated by adding alcohol. Other halogenised fatty acids, such as chlorpropionic may alternatively be used and the product is suitable for making non-inflammable films or a substitute for gelatine.

138,129. AMMONIUM SULPHATE SATURATORS. American Coke and Chemical Co., 208, South La Salle Street, Chicago, (Assignees of A. Roberts, 608, South Dearborn Street, Chicago). International Convention date, April 17, 1915.

The gas from which ammonia is to be absorbed enters the tower 5 at 6 and leaves it at 7. The tower is composed of separate sections 5, the number being varied according to the



138,129

proportion of ammonia. Each section is provided with two inclined baffles on one side and one on the other side, so that a tortuous path for the gas is formed in the tower. Sulphuric acid is supplied by the pipe 24 and flows in counter-current over the baffles to the vessel 8 which forms a liquid seal. Ammonium sulphate crystals are drawn off by a pipe 9, and the liquor overflows by the pipe 12 to another vessel 13 from which crystals may be similarly withdrawn. The crystals pass

from the shoot 10 to the draining table 18 and thence by the shoot 19 to the centrifugal 20. The liquor from the vessel 18 is returned by the pump 21 to the vessel 17 from which liquor is drawn by the pump 23 and returned to the tower. The tower sections are of cast-iron, lined with lead, and the lead linings are burned together at the flanges 34. The outlet pipe 7 is provided with pivoted baffles 35.

138,317. FILTERING LIQUIDS. Soc. Anon. des Etablissements A. Olier, Clermond-Ferrand, Puy-de-Dome France. International Convention date, January 31, 1919.

The plates of a filter press are clamped and withdrawn by a differential hydraulic ram, the smaller area of which is always open to the pressure water and tends to withdraw the plates, while the pressure water is admitted to the larger area of the ram only when it is desired to clamp the press. An emergency mechanical clamping gear is also provided.

138,328-9 and 138,330-1. GLYCERINE. Vereinigte Chemische Werke Akt.-Ges. 16, Salzufer, Charlottenburg, Berlin. International Convention dates, April 22, 1916; April 22, 1916; May 19, 1916; and June 18, 1917, respectively. All additions to 138,099.

138,328. Specification 138,099 (*see* THE CHEMICAL AGE, Vol. II., page 362) describes the production of glycerine by fermenting sugars in certain alkaline solutions. In this patent the alkaline substance is preferably a mixture of normal sodium sulphite and a hydrosulphite of sulph-oxylate or similar strong reducing agent.

138,329. The yeast used for the fermentation may be re-used by washing it in water, growing in a dilute acid medium, and gradually neutralising with alkali.

138,330. A yield of 33 per cent. of glycerine may be obtained by adding salts, such as magnesium sulphate and chloride to the sodium sulphite.

138,331. When the fermentation process is most active a further quantity of sugar with or without yeast and salts may be added. Additional salts mentioned are ammonium sulphate and potassium sulphate.

138,355. GAS ANALYSIS. Svenska Aktiebolaget Mono, 20, Norra Bantorget, Stockholm. International Convention date, January 29, 1919.

A gas-analysing apparatus is provided with a number of primary gas-measuring vessels any one of which may be connected to the system so that successive analyses of gas from different sources may be made. The apparatus is described in detail.

LATEST NOTIFICATIONS.

140,740. Kilns. C. H. Zwermann. March 27, 1919.
140,746. Explosives which are proof against Fire-damp, Process for the Manufacture of Gelatinous Nitro-Glycerine. Dynamit-Akt.-Ges. vorm A. Nobel & Co., and P. Naoum. March 22, 1919.
140,764. Dyeing Vats. A. A. Vallaeys. March 21, 1919.
140,775. Ores or the like, Apparatus for Concentrating. G. Grondal. March 22, 1919.
140,777. Ozone, Manufacture of. Soc. Anon. l'Azonte Francais. March 22, 1919.
140,784. Acetaldehyde from Acetylene, Process for the Production of. Soc. Anon. de Produits Chimiques. (Etablissements Maletra.) March 24, 1919.
140,798. Filter Presses. Worthington Pump & Machinery Corporation. March 9, 1918.

Specifications Accepted, with Date of Application

124,220. Oils and Fats, Process for Recovering—from Soap-Free Waste Water. Naamlooze Vennootschap A. Jurgen's Vereenigde Fabrieken. March 9, 1918.
132,496. Fertilisers containing Nitrogen and Phosphoric Acid. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. September 13, 1918.
135,817. Electro-osmotic Process for Removing Water from Materials. Elektro-Osmose Akt.-Ges. (Graf. Schwerin Ges.). October 20, 1917.
139,843. Electric Furnaces. E. Fenton. June 21, 1919.
139,880. Absorption towers, Distillation Columns and the like, Rings for Filling. R. Lessing. February 27, 1919.
139,957. Producer Gas Furnace. C. K. E. Bildt. May 22, 1919.
139,981. Carbazole, Manufacture and Isolation of. Burt, Boulton & Haywood, and F. D. Miles. June 19, 1919.
139,991. Filtering Fluids, Devices for. F. K. Atkins and E. F. Atkins. July 8, 1919.
140,001. Catalytic Heating Apparatus. Soc. Lyonnaise des Rechauds Catalytiques Camell, Cochet, Gritte, et Cie. April 24, 1919.
140,007. Sulphonation and Chlorination of Aromatic Substances. H. N. Morris & Co., and H. N. Morris. June 5, 1918.
140,011. Catalysing Material. British Thomson-Houston Co. (General Electric Co.). September 8, 1919.

Patents Court Cases

It is announced that licences have been granted by the Public Trustee under the Trading with the Enemy Acts, 1914-1918, to Perry & Co. (Bow), Ltd., in respect of the following Patents: 21,479/1908, G. M. Clark (Dellwik-Fleischer Wassergas Ges.); 12,242/1912, 12,243/1912, 17,690/1913, 17,691/1913, 17,692/1913, 18,028/1913, and 18,942/1913, all in the name of A. Messerschmitt. A similar application in respect of 17,591/1909, H. Lane, has been refused. All the patents relate to the manufacture of hydrogen.

Southall Brothers & Barclay

Centenary Year of the Company

SIR THOMAS BARCLAY presided at the annual meeting of the shareholders of Southall Bros. & Barclay, Ltd., manufacturing chemists, Birmingham, which was held on Wednesday, March 31.

The Chairman, in moving the adoption of the report, stated that the outstanding feature of the year's trading had been the enormous rise in the price of drugs of Japanese origin, and the increased scarcity of many crude drugs, especially those for which we are almost entirely dependent on the U.S.A. The question of price was, of course, affected to some extent by the adverse rate of exchange, but this accounted for only a small proportion of the increase, the main factor being the paucity of the quantity available, and the increased demands from Continental markets. Market manipulation had had something to do with the enormous increases in value. For instance in the case of turpentine, 27s. per cwt. was a normal pre-war price, and in times of great scarcity it had risen to 45s. or 50s. per cwt., but to-day they were compelled to pay nearly 10 times the normal pre-war price. It was apparent in the prices which were being demanded by Japan for articles of which she had the monopoly—namely, camphor, meththol and Japanese oil of peppermint.

Sir Thomas Barclay then referred to the possible effect of German competition. When the German factories were said to be settling down to serious business they had an opportunity of examining quotations from several German houses. Out of 31 articles which were offered in 26 cases the prices, in spite of the favourable rate of exchange, were much in excess of those ruling in this country, and where the prices were lower the articles offered were of minor importance, or the natural resources of the country placed the manufacturers in such a position that it was almost impossible for other countries to compete; as, for example, in the case of caustic potash. The export trade which hitherto went to Germany was, to a large extent, now being diverted to this country. The price of druggists' sundries were still rising. As an illustration, glass bottles were recently offered to them by a Continental house at a figure 50 per cent. lower than the price ruling here, but when the order was acknowledged they were informed that they found it necessary to advance the price 100 per cent. Continental goods generally had advanced during the year from 10 to 100 per cent.

Regarding the firm's scientific apparatus department, the Chairman stated that British manufacturers were still supplying the bulk of the laboratory ware that they sold and used, both glass, porcelain and filter papers. Graduated glass, which in the early days of the war was scarcely attempted, was now being made here in quantity and excellent quality. Their chemical laboratories had been fully employed, and output had shown a substantial increase. The demand for chemical products had been very great. Their plants for chloroform, salicylates, iodides, &c., had been fully engaged. The synthetic drug phenyl-quinolin-carboxylic acid increased in demand, as did hippuric acid and its salts.

With regard to the prospects of the fine chemical industry in this country, little, if any, German competition had been felt up to the present, whilst the adverse condition of the American exchange had effectually handicapped the American manufacturer in his efforts to undercut this market. Sir Thomas added that this was the centenary year of the company.

The report showed a net profit of £32,159, an increase of £6,395; and on the ordinary shares a dividend of 10 per cent., free of tax with a bonus of 1s. per share, also free of tax, was recommended. £6,000 was written off goodwill, and a similar sum carried to reserve.

The report was approved, and Mr. T. Barclay and Mr. W. E. Hipkiss, retiring directors, were re-elected.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

THURSDAY, APRIL 8.

There is little change to report in the market position owing to the holidays. It would seem that quite a number of people are still away, and it will probably be the end of the week before business again resumes its normal course.

General Chemicals

ACETONE.—This product is higher in price, and it is understood that the Government stocks have now been disposed of.

ACID ACETIC is firm, and all parcels arriving are readily absorbed at advancing figures.

ACID CARBOLIC is without change.

ACID FORMIC is in very good demand and price is inclined to be firmer.

ACID OXALIC remains extremely scarce, but price is nominally without change.

ACID TARTARIC has still further advanced, and the demand very greatly exceeds the supply.

ARSENIC is in moderate request and price is without change.

BARIUM SALTS are moving off steadily.

BLEACHING POWDER is without change.

FORMALDEHYDE is practically unobtainable, and fancy figures are paid for any supplies that become available.

GLAUBER SALTS are still badly wanted on export account, and high prices are paid.

IRON SULPHATE (GREEN COPPERAS) is in good request, and price is inclined to be firmer.

LEAD ACETATE is moving off very well, but there is no change in price.

POTASSIUM BICHROMATE is without change.

POTASSIUM CARBONATE is in fair request at last quoted figures.

POTASSIUM NITRATE has been again advanced in price.

POTASSIUM PERMANGANATE is in active request, and supplies are now being rapidly absorbed. Price is steady

POTASSIUM PRUSSIATE is in much better request, and price is inclined to move upward

SODIUM ACETATE is only in moderate request, without change in value.

SODIUM BICHROMATE is without change.

SODIUM CHLORATE is slow of sale.

SODIUM CAUSTIC is again in brisk demand, and the undertone is extremely firm. Home trade prices are unchanged.

SODIUM HYPOSULPHATE is scarce and firm.

SODIUM NITRITE is extremely scarce and inclined to go higher.

SODIUM PHOSPHATE is in good request.

SODIUM PRUSSIATE is almost unobtainable for near delivery, and a slight further advance is to be noted.

SODIUM SULPHIDE is again higher, and all parcels on offer are readily absorbed.

TIN SALTS are only in moderate request.

ZINC SALTS are in fair demand.

Coal Tar Intermediates

There is very little change to report. Some small quantities are arriving from America, but as these were all sold long since it is a factor which does not tend to relieve the stringency to any extent.

ALPHA NAPHTHOL.—English makers cannot now give early delivery of this material.

BETA NAPHTHOL.—The price has been advanced on English material, and makers are fully sold for many months ahead.

DIMETHYLANILINE is in strong request, but there is practically nothing available.

NAPHTHIONATE OF SODA is steadily called for, and price is without change.

PHTHALIC ANHYDRIDE is easier, better supplies being available.

SALICYLIC ACID is well inquired for, and is very firm with an upward tendency in sympathy with phenol.

Coal Tar Products

There is little change to report since last week.

90's BENZOL remains at 2s. 5d. on rails.

CRESYLIC ACID supplies are still scarce, and for Pale quality 97/99 per cent. the price is 4s. 3d. per gallon; for Dark 95/97 per cent., 4s.

CREOSOTE OIL remains firm at about 11½d. to 1s. in the North, and 1s. to 1s. 0½d. in the South.

SOLVENT NAPHTHA is worth 3s. 3d. to 3s. 4d. per gallon.

HEAVY NAPHTHA is still worth 3s. 6d. per gallon and is difficult to obtain.

NAPHTHALENE is very scarce. Crude is worth from £14 to £18 per ton, and refined from £34 to £38 per ton.

PITCH.—The market is firm, and full prices are required at both East and West ports, but owing to the high rate of exchange in France business is somewhat limited. Sellers are very scarce for next season's deliveries.

Sulphate of Ammonia

There is no change to report.

Current Prices

Chemicals

	per	£	s	d.		£	s.	d.
Acetic anhydride	lb.	0	3	3	to	0	3	6
Acetone oil	ton	83	0	0	to	85	0	0
Acetone, pure	ton	97	0	0	to	100	0	0
Acid, Acetic, glacial, 99-100%	ton	110	0	0	to	115	0	0
Acetic, 80% pure	ton	92	10	0	to	95	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	3	to	0	1	5½
Acid, Citric	lb.	0	6	6	to		—	
Formic, 80%	ton	115	0	0	to	120	0	0
Gallic, pure	lb.	0	7	3	to	0	7	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	65	0	0	to	70	0	0
Lactic, 60 vol.	ton	80	0	0	to	85	0	0
Nitric, 80 Tw.	ton	40	0	0	to	42	0	0
Oxalic	lb.	0	2	9	to	0	2	10
Phosphoric, 1.5	ton	60	0	0	to	65	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	3	0	to	0	3	3
Salicylic, B.P.	lb.	0	3	9	to	0	4	0
Sulphuric, 92-93%	ton	7	15	0	to	8	5	0
Tannic, commercial	lb.	0	5	0	to	0	5	3
Tartaric	lb.	0	4	0	to	0	4	1
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	10	0	to	10	0	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	35	0	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	95	0	0	to	97	10	0
Ammonia, muriate (galvanisers)	ton	52	0	0	to	54	0	0
Ammonia, nitrate	ton	60	0	0	to	65	0	0
Ammonia, phosphate	ton	135	0	0	to	140	0	0
Ammonia, sulphocyanide	lb.	0	2	3	to	0	2	6
Amyl, acetate	ton	360	0	0	to	370	0	0
Arsenic, white, powdered	ton	67	10	0	to	70	0	0
Barium, carbonate	ton	13	10	0	to	14	10	0
Barium, carbonate, 92-94%	ton	14	10	0	to	15	0	0
Chlorate	lb.	0	1	4	to	0	1	5
Chloride	ton	30	0	0	to	31	0	0
Barium, Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	10	0	to	19	0	0
Borax crystals	ton	41	0	0	to	42	0	0
Calcium acetate, Brown	ton	19	10	0	to	20	10	0
,, Grey	ton	0	0	0	to	42	10	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	10	10	0	to	11	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	47	0	0	to	48	0	0
Cream Tartar, 98-100%	ton	305	0	0	to	310	0	0

	per	£	s.	d.		£	s.	d.
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	350	0	0	to	360	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	5	0	0	to	5	10	0
Glycerine, crude	ton	72	0	0	to	74	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	9	to	0	3	0
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	15	0	to	5	0	0
Lead acetate, white	ton	105	0	0	to	110	0	0
Carbonate (White Lead)	ton	75	0	0	to	78	0	0
Nitrate	ton	80	0	0	to	85	0	0
Litharge	ton	65	0	0	to	67	10	0
Lithophone, 30%	ton	60	0	0	to	62	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	14	0	0	to	14	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	180	0	0	to	185	0	0
Sulphate	ton	80	0	0	to	82	10	0
Methyl acetone	ton	90	0	0	to	92	10	0
Alcohol, 1% acetone	gall.	Nominal						
Nickel ammonium sulphate, single salt	ton	50	0	0	to	52	10	0
Potassium bichromate	lb.	0	2	2	to	0	2	3
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	1	to	0	1	2
Hydrate, 88-90%	ton	115	0	0	to	120	0	0
Meta-bisulphite, 50-52%	ton	270	0	0	to	280	0	0
Nitrate, refined	ton	72	10	0	to	75	0	0
Permanganate	lb.	0	6	6	to	0	7	0
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	4	to	0	2	5
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	60	0	0	to	62	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Sodium, Bichromate	lb.	0	2	0	to	0	2	1
Bisulphite, 60-62%	ton	44	10	0	to	45	10	0
Chlorate	lb.	0	0	5½	to	0	0	6½
Caustic, 70%	ton	43	10	0	to	44	10	0
Caustic, 76%	ton	44	10	0	to	45	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	28	10	0	to	29	10	0
Nitrite, 96-98%	ton	120	0	0	to	125	0	0
Phosphate, crystal	ton	39	0	0	to	40	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	2	0	to	0	2	1
Sulphide, crystals	ton	24	0	0	to	25	0	0
Sulphide, solid, 60-62%	ton	48	0	0	to	50	0	0
Sulphite, cryst.	ton	14	10	0	to	15	10	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	25	0	0	to	27	0	0
Roll	ton	24	0	0	to	26	0	0
Tartar emetic	lb.	0	3	5	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	9	to	0	3	0
Zinc chloride, 102 Tw.	ton	24	0	0	to	26	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	82	10	0	to	85	0	0
Oxide, 94-95%	ton	67	10	0	to	70	0	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	23	0	0	to	24	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	5	0	to	0	5	3
Alphanaphthylamine	lb.	0	3	6	to	0	3	9
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	6	to	0	5	9
Benzidine, base	lb.	0	12	6	to	0	13	6
Benzidine, sulphate	lb.	0	10	0	to	0	11	0
Benzoic, acid	lb.	0	5	9	to	0	6	0
Benzoate of soda	lb.	0	5	9	to	0	6	0
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	5	0	to	0	5	3
Betanaphthylamine, technical	lb.	0	8	6	to	0	9	0

	per	£	s.	d.		£	s.	d.
Croceine Acid, 100% basis	lb.	0	5	6	to	0	6	6
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	6	to	0	3	9
Dimethylaniline	lb.	0	4	9	to	0	5	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	13	6	to	0	14	0
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	5	6	to	0	5	9
Naphthionate of Soda	lb.	0	6	0	to	0	6	6
Naphthylamin-di-sulphonic-acid	lb.	0	6	0	to	0	6	6
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	0	to	0	1	2
Orthotoluidine	lb.	0	2	9	to	0	3	0
Orthonitrotoluol	lb.	0	1	6	to	0	1	8
Para-amidophenol, base	lb.	0	15	0	to	0	16	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	0	8	0	to	0	8	3
Paranitrophenol	lb.	0	2	6	to	0	2	9
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	6
Phthalic anhydride	lb.	0	6	0	to	0	6	6
R. Salt, 100% basis	lb.	0	4	6	to	0	4	9
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	6	3	to	0	6	6
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	9	to	0	1	10
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

English China Clays

THE following particulars of English China Clays, Ltd., are issued in accordance with Stock Exchange requirements. The company was incorporated in April, 1919, and has an authorised capital of £2,000,000, divided into 400,000 7 per cent. cumulative preference shares and 1,600,000 ordinary shares. The issued capital is 270,686 cumulative preference shares and 1,210,000 ordinary shares. The whole of this capital has been issued to the shareholders of the companies with which the present company has amalgamated. These are Martin Brothers, the West of England and Great Beam Clay Company, and the North Cornwall China Clay Company. The china clay works of John Nicholls & Co. have also been recently acquired. The properties acquired create for the company an exceptional position in the china clay trade and enable it to cater for the requirements of any users of china clay or china stone at home and abroad. The company has the capacity for producing about 500,000 tons of china clay, 25,000 tons of china stone, and 5,000 tons of ground china stone annually.

Chemists and Works Management

MR. J. R. HYDE, Assoc. Met., in an address last week on "The Laboratory as a Training Ground for Works Management," to the members of the Sheffield Association of Metallurgists and Metallurgical Chemists at the Royal Victoria Hotel, urged that in addition to specialising in scientific chemistry, they should obtain a knowledge of commercial subjects. Much of what the lecturer said was built up on experiences during a recent industrial tour of America. There he had had opportunities of witnessing new methods of production and organisation, and was greatly impressed by the way in which American manufacturers were able to use unskilled and untutored labour with very satisfactory results, so far as output was concerned. Mr. Hyde defined a laboratory as a purely scientific department, responsible for all kinds of researches—microscopic, physical, chemical and electrical—and also for the testing of metals. It had also a part, from the scientific side, in the control of operations, but was generally non-commercial. His idea of works management was substantially a department responsible for the running of a commercial unit, where output costs and capital expenditure were accepted measures of efficiency and satisfaction. One noticeable fact in American management, he said, was the remarkable variety of posts which the heads of departments seemed to have filled in different lines of manufacture. In American shipyards men had been trained in such different spheres as typewriter, packing, and motor-car factories. This, however, usually had for its foundation a college education.

Company News

WEARDALE LEAD.—An interim dividend of 6d. per share has been declared, free of tax, payable on April 14. The dividend was the same a year ago.

VIRGINIA (CAROLINA) CHEMICAL.—Quarterly dividends of 2 per cent. have been declared on preferred, payable April 15, and 1 per cent. on common stock, payable May 1.

BORAX CONSOLIDATED.—The directors have declared a dividend of 6 per cent. per annum, less tax at 6s. in the £, on the preferred ordinary shares in respect of the half-year to March 31.

CANADIAN EXPLOSIVES.—A dividend of 1¾ per cent. has been declared on the 7 per cent. cumulative preferred shares for the quarter to March 31, payable April 15 to holders registered March 31.

ENGLISH CHINA CLAYS.—The net profits for the past year were £31,238 after providing for interest charges. A dividend of 5 per cent. per annum on the ordinary shares from the dates of allotment is proposed, writing £6,384 off preliminary expenses, adding £5,000 to the reserve, and carrying forward £2,942.

HOME-GROWN SUGAR.—The Minister of Agriculture has appointed Sir James Martin, senior partner of Messrs. Martin, Farlow & Co., chartered accountants, London, and formerly secretary of the Society of Incorporated Accountants, to be the financial representative of the Government upon the board of directors.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS.—The directors recommend a dividend of 4 per cent. (actual) for the half-year to December 31 last, on the ordinary shares. Provision has been made in the accounts for depreciation, sinking funds and reserves amounting to £119,747, leaving a balance to be carried forward of £143,511.

BRITISH ALUMINIUM.—At an extraordinary general meeting held on Tusday the resolution passed at the meeting on March 15, altering the articles of association with a view to the capitalisation of reserves, was confirmed as a special resolution. The resolutions to increase the capital and to capitalise part of the reserve (*see* THE CHEMICAL AGE, March 20, p. 315) were also passed.

BENZOL & BY-PRODUCTS.—Letters of allotment have been posted in connection with the issue of £336,000 10 per cent. cumulative convertible preference shares. It is understood that the first dividend at the rate of 10 per cent. per annum will be paid on or about August 1 next, and that negotiations will shortly be concluded in respect of a 15 years' contract for the supply of waste gas from the company's ovens for lighting a neighbouring town.

SIR W. G. ARMSTRONG, WHITWORTH.—It is understood that Lazard Brothers & Company, Ltd., have placed privately, on the basis of a yield to redemption of £8 3s. per cent., an amount of £1,380,000 7½ per cent. three year notes of Sir W. G. Armstrong, Whitworth & Co., Ltd. These notes are issued at the request of the Belgian Government in connection with an order for locomotive engines, and that Government has undertaken to provide Sir W. G. Armstrong, Whitworth & Co., Ltd., with funds to meet both principal and interest.

BARRY, OSLTERE & SHEPHERD.—The report to January 31 last states that the active demand for goods referred to in the last report was well maintained in the past year. After providing for debenture interest, depreciation, &c., and excess profits duty, there remains, with £67,812 brought in, £287,880. After paying preference dividend the directors carry £90,000 to special depreciation and contingency accounts, and recommend a dividend at the rate of 12½ per cent., free of tax, on the ordinary shares, payable April 21, carrying forward £99,755, subject to directors' fees.

GLEBOFF GROSNY PETROLEUM.—At an extraordinary general meeting, on March 22, it was resolved that the directors be authorised to carry into effect the proposed acquisition of new properties. Lord Teynham, who presided, said that the purchase price had been fixed at £100,000, but the vendors had so much confidence in the properties that they had agreed to apply for shares to the whole of that amount, and, in addition, had arranged with a group of financiers, upon the purchase being carried through, to supply the company with working capital to the extent of over £150,000.

PENGKALEN, LTD.—The board have arranged for an issue of 80,000 Preferred Ordinary shares at par, to provide the necessary capital for dredging plant. The shares are being offered to all members whether they are holders of Ordinary or Preferred Ordinary shares. They are not being offered as of right, but in making the allotments the board will have regard to the present holdings of the shareholder; no allotment, however, will be made in excess of four shares for each five now held. Arrangements have been made for the underwriting of the whole issue at a commission of 5 per cent., payable in cash.

RIO TINTO CO.—The report for the year ended December 31, states that all the expenses having been provided for, the profit at the credit of revenue account, including £542,444 brought forward, amounted to £1,187,220. From this £1,050 is provided for plant gone out of use and written down; loss on sale of Exchequer Bonds, £2,650; to staff provident fund, £3,000 (against £4,000); leaving a balance of £1,179,920. A final dividend of 20s. per share on the Ordinary shares is recommended, making a total dividend of 40 per cent., against 50 per cent. The balance carried forward is £348,670.

Catalogues Received

H. B. P. Humphries (The Sulphuroxides Co.)

An interesting list of sulphur dioxide plant. This includes sulphur burners, gas coolers and scrubbers, complete sulphuring and sulphitation plants, and installations for sulphurous acid solutions, sulphites, bisulphites, hydrosulphites, anhydrous liquid sulphur dioxide, high strength sulphuric acid and oleum. Illustrations are given, and the special features of the various types of plant are pointed out.—14, Old Queen Street, Westminster, S.W.1.

The British Aluminium Co., Ltd.

We have received Nos. 2, 3 and 4 of a series of booklets published by this company, containing hints on the working of aluminium. The three mentioned deal with aluminium sheet, aluminium circles and aluminium tubes respectively. The booklets are published in consequence of the large number of inquiries from works' foremen and operatives which have been received by the company, and are written in a concise and handy form for the information of the workers. Very useful tables of thickness, weight, size, &c., are included.—109, Queen Victoria Street, London, E.C.4.

Newcastle Graphite Company, Ltd.

A leaflet setting forth particulars of the artificial graphite electrodes for electric smelting furnaces and electrolytic work supplied by this company. The product is supplied in sizes ranging from 1 in. diameter × 36 in. long to 12 in. diameter × 48 in. long, either plain or with screwed ends and jointing screws. The specific resistance is approximately ohms per cubic inch 0·0003. The works are specially interesting in view of the fact that they are the only ones of their kind in Great Britain. Prior to the formation of the company, English metallurgical and chemical works were dependent upon foreign supplies of this product, so that the industry, introduced into this country during the war, may be regarded as a key industry.

The Pulsometer Engineering Co. Ltd.

A well illustrated booklet describing the various types of "Geryk" air pumps, including the new high vacuum pump "R. L." type (Fleuss' Patents), with prices and list of accessories. The single-cylinder pattern "Geryk" pump will give a vacuum of 1·50 mm. off perfect, whilst with the "R. L." type a vacuum of 0·00001 mm. can be obtained. The "Geryk" pump can be made in almost any size, and its design is extremely simple. The booklet also contains a description of the Fleuss' patent pumps for evaporation, desiccation and distillation. These pumps are capable of evaporating moisture at any temperature down to zero F., and of carrying on desiccation to a degree considerably beyond that which is possible with a cold water condensing plant. Compression pumps are also illustrated, and can be supplied, either single or multi-stage, for compressing gases up to 5,000 lb. per square inch.—Nine Elms Iron Works, Reading.

Peter Brotherhood, Ltd.

Three illustrated catalogues dealing with the various types of machinery supplied. The first describes types of centrifugal pumps covering a range up to 4,500 gallons per minute at 70 ft. head, although in most cases they can be worked against a greater head or for greater capacity. Particulars of construction are given, as well as photographs and sectional views, weights, dimensions, and tables of powers, speeds and capacities. The second, written in five languages, contains particulars of a very wide range of machinery, including electric generating plant, air and gas compressors, electric motors, steam engines, dynamos, turbines, marine circulating pumps, pressure gauge-testing machines, refrigerating plant, &c., with illustrations in each case. The pressures of the gas compressors range up to 6,000 lb. per square inch, and the compressors are fitted with a very complete lubrication system. This latter is economical, since the oil is used over and over again. On leaving the bearings it falls by gravity into a sump and passes through a filter to the oil pressure pump, whence it is distributed to the bearings. A large number of the steam turbines are used in chemical works as back-pressure turbines, the steam leaving the turbines at a back pressure of from 1½ to 20 lb. above the atmosphere, and then being used for heaters, boilers or digesters. In connection with refrigerating machinery, plants are supplied for such purposes as gas condensation, desiccation of air and gases, pulverising crystaline precipitates, cooling and crystalising out various salts, setting and solidifying glue, &c. Ammonia valves, purifiers, separators, filters, tanks and fittings are shown in the third list, with tables of measurement, &c.

British Portland Cement Manufacturers

AT the annual general meeting held last week, the Hon. F. C. Stanley (Chairman of the Company) referred to the establishment by the company of a new cement works in India in conjunction with the Associated Company. Contracts have now been entered into for for the supply of the necessary plant, but it will take a year or more before the works are completed. A good site has been secured, favourably situated for distribution in the best markets, as well as an abundance of suitable raw material.

Benn Brothers Journals

Some Features of the Current Issues

AERONAUTICS.

"Position of Civil Aviation"; "Performance Calculations of an Aeroplane," by Frederick J. Grose.

THE CABINET MAKER.

"The Furnishing of Cottages, Small Houses and Flats"; "The Cutting of Loose Covers for Cushions."

THE ELECTRICIAN.

"Electrical Winding Apparatus," by H. H. Broughton (continued); "Some Modern Electrical Welding Machines"; and details of electrical exhibits at the Birmingham Trade Exhibition.

THE FRUIT-GROWER.

"A Day's Work"; Soil Aldehydes: "A Problem in Plant Behaviour"; "Fruit Growing in the West Country."

THE GAS WORLD.

"The Gas Industry in Scotland"; Analyses of Accounts of Scottish gas undertakings; "The Correct Use of Gas."

THE HARDWARE TRADE JOURNAL.

Illustrated articles on Tool Steel Economies and Welding for Repair Work; "How to Start a Retail Business" (continued); Metal prices at home and abroad, and special metal charts.

WAYS AND MEANS.

"The Fun of the Fair," by C. E. Hughes; "Housing in the Midlands," by Joseph B. Hobman; and "The Minimum Wage Legislation of the World," by Victor Gollancz.

PATENTS AND DESIGNS ACTS, 1907 & 1919.

MANUFACTURE OF PHENOLIC CONDENSATION PRODUCTS.

The proprietors of British Letters Patent No. 9292 of 1914 are prepared to sell the patent or to license British Manufacturers to work under it. It relates to the reaction together of an anhydrous methylene body, a phenolic body and a phenolic compound having an alkylated hydroxyl group in its molecule.

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